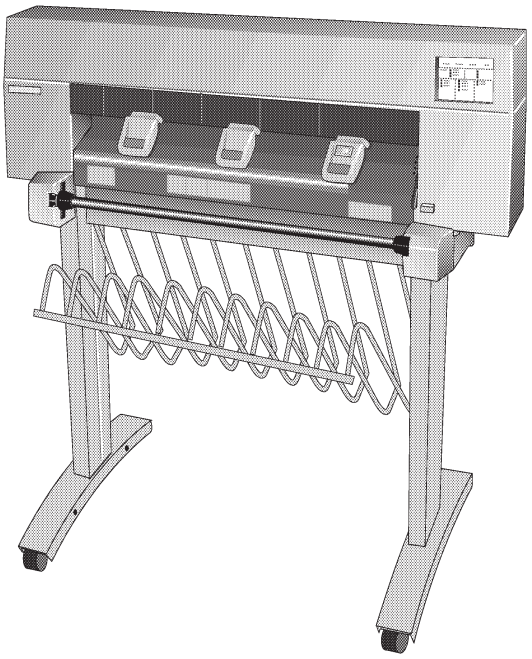

Service Manual

HP DesignJet 430
HP DesignJet 450C
HP DesignJet 455CA
Printers

For HP Internal Use Only

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First edition, September 1997

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WARNING

The procedures described in this manual are to be performed by HP-qualified service personnel only.

Electrical Shock Hazard

Serious shock hazard leading to death or injury may result if you do not take the following precautions:

- Ensure that the ac power outlet (mains) has a protective earth (ground) terminal.
- Disconnect the Printer from the power source prior to performing any maintenance.
- Prevent water or other liquids from running onto electrical components or circuits, or through openings in the enclosure.

Electrostatic Discharge

Refer to the beginning of Chapter 8 of this manual, for precautions you should take to prevent damage to the Printer circuits from electrostatic discharge.

Safety Symbols

General definitions of safety symbols are given immediately after the table of contents.

Product Support, Barcelona Division

Hewlett-Packard Española, S.A.
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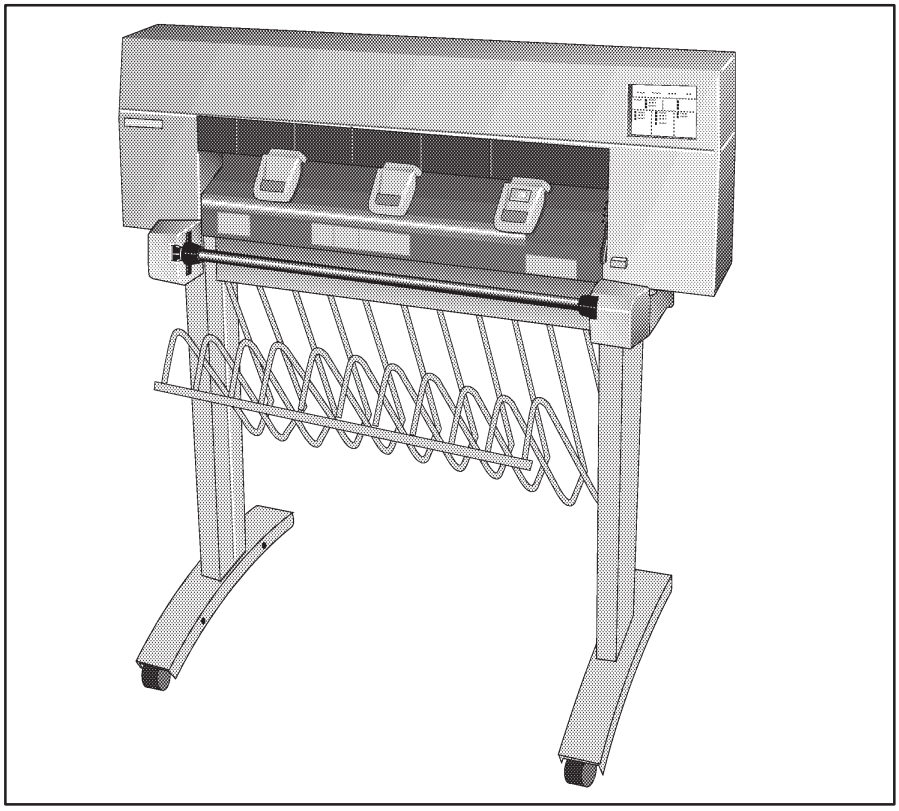
Spain

Service Manual



HP DesignJet 430
HP DesignJet 450C
HP DesignJet 455CA
Printers

Using this Manual

Purpose

This manual contains information necessary to test, calibrate and service:

- HP DesignJet 430 printers (models C4713A and 4714A).
- HP DesignJet 450C printers (models C4715A and 4716A).
- HP DesignJet 455CA printers (models C6080A and C6081A).

For information about using these printers, refer to the corresponding user and quick-reference guides.

Readership

The procedures described in this manual are to be performed by HP-certified service personnel only.

Part Numbers

Part numbers for plotter options, accessories and service parts are located in chapter 7.

Conventions

This manual contains information for the color HP DesignJet 430, 450C and 455CA printers.

A small arrow ➧ is used to indicate other parts of the Service Manual or User's Guide where you can find information related to the topic you are consulting.

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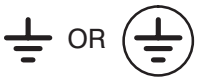
General Definition of Safety Symbols

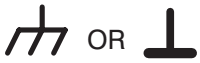
International caution symbol (refer to manual): the product is marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.

Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts must also be marked).



Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal that must be connected to ground before operating equipment.

Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of a fault. A terminal marked with this symbol must be connected to ground in the manner described in the installation (operating) manual, and before operating the equipment.



Frame or chassis terminal. A connection to the frame (chassis) of the equipment, which normally includes all exposed metal.

Alternating current

Direct current

Alternating or direct current

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury.

Take care not to cut yourself on the encoder strip inside the plotter.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

1

Troubleshooting

Introduction

This chapter will guide you through the relevant steps to take when troubleshooting the printer.

Is the Printer Using the Latest Firmware Revision?

Before spending time troubleshooting the problem by doing the various tests or replacing parts (which may not need replacing), check which firmware revision the printer is using. To check which firmware revision the printer is using, *Print the Service Configuration Plot* ➧ page 4-29. Some problems which occurred in earlier firmware releases may have been solved in later revisions. So if there is a new firmware revision then replace the Firmware SIMM before replacing any parts.

Important Information

The Printer firmware is contained either on a flash ROM SIMM at the back of the Printer or on a masked ROM inside the electronics module. The firmware-revision level, for example A.01.03, is printed by the Printer on the setup sheet and on the service configuration plot. The revision level is also printed on a label on any flash ROM SIMM. Do not open the electronics module.

Important: When replacing the electronics module, always remember to check the firmware revision level of the **new** electronics module. The revision level will be printed on the top surface of the module. Also, check the firmware revision level of the ROM SIMM installed in the **old** electronics module. With this information you must do the following:

1. If the firmware revision level of the ROM SIMM in the old electronics module is **lower** than the firmware revision level of the new electronics module, then you **must not** install the ROM SIMM into the module.
2. If the firmware revision level of the ROM SIMM in the old electronics module is **higher** than the firmware revision level of the new electronics module, then you **must** install the ROM SIMM into the module.

   Example 1: The ROM SIMM firmware revision level is A.01.03 and the firmware revision level of the electronics module is A.01.04. You would use the electronics module **without** the ROM SIMM installed.

   Example 2: The ROM SIMM firmware revision level is A.01.05 and the firmware revision level of the electronics module is A.01.04. You would use the electronics module **with** the ROM SIMM installed.

What Can I do when a System Error Code Appears on the Front-Panel Display?

Chapter 2 contains a list of system error codes and their respective descriptions and recommended corrective actions. Only try one recommended action at a time and check if the error code has disappeared.

If you have an error code which is not documented in this Service Manual or you have an error which you cannot resolve, then report the error to the HP Response Center or the nearest HP Support Office. When reporting the error, have the following information ready:

- Model and Serial Number of the printer.
- Which firmware revision the printer is using.
- The complete error code.
- The Service Configuration Plot.
- The Current configuration sheet.
- Which software application the customer is using (name, version, etc.).
- Is the problem reproducible by you?
- Additional comments about the usage, the setting, etc..

Have you performed a Service Test on the Failed Component/Assembly?

If possible, always perform a Service Test on the component/assembly that you are about to replace, just to make sure that is the component/assembly that has failed. **If the test on that component/assembly passes, you should NOT replace it.** For information on the Service Tests and how to use them ➧ Chapter 4.

Have you Performed the Accuracy Calibration?

Is the printer calibrated correctly after replacing a component? Refer to Chapter 5 to check when the Accuracy Calibration is required.

What can I do to Solve Print-Quality Problems?

Whenever an Print-Quality problem appears, it is advisable to print the Print-Quality Plot to help diagnose the problem. The Print-Quality Print will help you differentiate between possible Cartridge errors and other problems such as incorrect front-panel selection, driver or RIP configuration or mechanical problems. For information on solving Print-Quality problems ➧ Chapter 6.

What can I do if the Line Sensor has Problems Detecting Media?

1 Excessive ink deposits on the drive-roller surface can fool the sensor by reflecting the light. Clean the drive-roller ➧ Chapter 9.

2 **Line sensor incorrectly calibrated:** The accuracy calibration includes calibration of the line sensor on the carriage. You must use HP Matte film when performing the accuracy calibration (Details ➧ Chapter 5). Otherwise the line sensor will have problems loading some types of media.

3 The Line Sensor is faulty. Replace the Carriage Assembly ➧ page 8-37.

What can I do if the Carriage is Noisy?

1 Dirty Carriage bushings. Remove dust particles from the Carriage bushings and from the slider rod along which the Carriage moves. If necessary, apply lubricant to the slider rod.

2 Make sure that the belt is correctly positioned on the Y-axis motor.

3 Remove dust particles from the Back Beam and, if necessary, apply grease.

4 Check for a faulty Carriage. Perform the Carriage Axis Test ➧ page 4-10.

What can I do if the Cover Sensor isn't Working?

The cover sensor is part of the front-panel assembly.

1 Before troubleshooting, make sure that you are not in Service Mode 1 because the Cover sensor is disabled and Printer will think that the cover is always closed. Power OFF the Printer and switch it back ON again and check if the Cover sensor works.

2 Check if the cable for the front-panel assembly is connected correctly to the electronics module.

3 Replace the front-panel assembly ➧ page 8-12.

What can I do if the Carriage Assembly has problems parking in the Service Station?

1 **Mispositioned trailing cable:** The trailing cable may be preventing the carriage from reaching the left-hand stop. Make sure that the trailing cable is positioned under the plastic tabs at the back of the carriage cover, and not above them.

2 The Carriage is not at the correct height. Check and, if necessary, adjust the Carriage height (Details ➧ chapter 5).

3 The Belt is not correctly positioned over the idler pulley.

4 Check for a faulty bail lever mechanism because the Carriage may have trouble passing over it.

What can I do if the Printer continuously rejects Cartridges?

If you are in Service Mode 1, the cover sensor is disabled. In order to test a new Cartridge set, the Printer must be powered OF and and ON again.

1 **Remove tape and align cartridges:** One frequent cause of cartridge problems is that the user has forgotten to remove the tape from new cartridges. Remove the tape.

2 **Dirty pads:** The connection between the carriage PCA and the cartridge flex connector is made by means of a gold bubble on the flex connector that touches a gold pad on the PCA. The Carriage Test (details ➧ page 4-12) includes a test of this connection. When nozzle failures occur, clean the flex contacts on the cartridge and in the Carriage.

3 **Continuity Problem:** Remove all the cartridges from the Carriage and try installing just the rejected cartridge. If the cartridge is still rejected then replace the cartridge with a new one. If the new cartridge is not rejected then check, one by one, if the other cartridges are rejected or not.

4 **Faulty cartridge:** Some black cartridges (51640A) with USE BEFORE dates of April '96 and earlier may have thin-film damage. This means that the material used for channeling ink behind the nozzles can crack with aging. When this happens, ink seepage may cause many nozzles to fail (eight or more). Replace the black cartridge with one with USE BEFORE date of May '96 or later.

5 If the Cartridges are not inserted correctly into the Carriage, the Cartridges will be rejected. Make sure that the springs that hold the Cartridges in the Carriage are not broken or misplaced.

6 Perform the Carriage Test ➧ page 4-12.

7 Replace the Trailing Cable ➧ page 8-8.

8 Replace the Carriage Assembly ➧ page 8-37.

What can I do if the Media continuously crashes?

1. Check if the media loaded is HP approved. If the media is not HP approved, advise the customer to use HP media and check to see if the problem is now solved.
2. **Anti-static brush:** If this brush (located under the entry platen) is damaged or removed, static charge can build up on the media. A charge can cause the media to stick to itself and jam the Printer.
3. The Carriage is at the incorrect height in relation to the Drive Roller. Check and if necessary adjust the carriage-to-media distance ➧ page 5-5 and try to load the media again.
4. The Drive Roller is installed incorrectly. Remove the Drive Roller and install in the correct position ➧ page 8-44 and try to load the media again.
5. The overdrive wheels turn free in both directions, creating bubbles in the media. Make sure that the Clutch assembly is installed correctly and is not faulty.
6. **Missing or damaged starwheels**. Make sure that all the starwheels on the bail assembly are correctly installed and turn properly.
7. **Missing Media Deflectors**. Make sure that all the Media deflectors are installed on the Printer, otherwise there could be media crashes.

What can I do if the Printer does not Power ON?

1. Check that the power cord is connected correctly.
2. Check that the ROM SIMM (firmware) is installed correctly in the correct slot (the slot furthest from you) at the back of the Printer.
3. Try to disconnect all the cables, apart from the Front Panel Cable, from the Electronics Module and then try to power ON the Printer again. If nothing appears on the front-panel display, then replace the Electronics Module ➧ page 8-13. If the Printer does Power On with the cables disconnected, then the problem must be with another component of the Printer. To find the faulty component, power OFF the Printer and connect one of the cables and power ON again. Once the faulty component is connected, it will not allow the Printer to power ON. This component should then be replaced.

What can I do if the Printer has problems with Media Loading?

1. Check that the Media Sensor is installed correctly.
2. Check if the cable for the Media Sensor is connected correctly.
3. Check if the Pincharms are down (the Pincharm lever should be **up**).
4. If the media is continuously rejected during the media edge check, then make sure that the Line Sensor is installed correctly. If necessary, perform the Carriage Test ➧ page 4-12.
5. Make sure the line sensor is calibrated. Perform the Accuracy Calibration ➧ page 5-2.
6. Replace the Media Sensor (part of the overdrive assembly) ➧ page 8-50.
7. Replace the Carriage Assembly ➧ page 8-37.

   Only replace one component at a time and check if the problem has been solved before replacing another component. Using this procedure you will be able to determine exactly which component failed.

What can I do if the Printer has problems with the Cutter?

1. If the Carriage Assembly has problems picking up the Cutter:
   - Check that the cable for the Front-Panel Assembly is is not loose and is routed correctly in the cover clips. A loose cable can be trapped by the Cutter, preventing the Cutter from moving.
   - Make sure that the Spittoon Assembly is correctly installed and is aligned with the Overdrive Assembly. If the Spittoon is loose or mispositioned, the cutter will have problems parking in the right cover.
2. If the media crashes when moving the Cutter:
   - Make sure that there is no media trapped inside the Cutter mechanism. Remove the Cutter to inspect it correctly.
   - Remove the Cutter and make sure that both rotary blades are touching each other by the flat sides and not the sloping sides. If the rotary blades are touching each other by the sloping sides, you must reseat them.
   - If the Printer is placed on a table, it must be placed as close to the edge as possible to make sure that the media that is coming out falls correctly. If the Printer is in the middle of the table, the media that is coming out will be lifted up causing the cutter to crash into it.

What can I do if the Bail Mechanism Fails?

1. **Obstructions:** Check that there are no obstructions in the way of the Bail Assembly.
2. **Wearing of parts:** The cam gear and engaging gear may not make correct contact with the left drive-roller gear even though the carriage is actuating the engaging lever. This can happen due to excessive wearing of parts. Another problem may be that the bail cable has broken.
3. **Carriage motor control:** The carriage may not properly locate the engagement lever, preventing the gears from engaging. Any problems with the carriage-motor control system (for example, the encoder strip) or associated mechanics could cause this problem. Also, if the carriage cannot find the true left stop during initialization (caused by interference), the engaging lever cannot be located.
4. **Bail cam:** The bail may fall from the up position. This can happen if the cam is over or under-rotated. The notch on the cam, used to engage the left bail bracket, is not properly located for the "bail up" condition, and the bail falls abruptly. Perform a bail cycle test.
5. **Adjust carriage:** If the carriage moves over the engaging lever without raising it, you may need to adjust the carriage angle on the slider rod. (Details ➧ page 5-5.) However, be careful not to jeopardize the print quality, which is very sensitive to the carriage angle.

EEROM Errors

What is an EEROM error?

An EEROM error means that some of the internal tests that the firmware performs have detected that, when re-reading information from the EEROM, it doesn't correspond to the information that had previously been written there, or that the checksum of all the information is incorrect. This failure has five possible causes:

- Faulty electronics module.
- Contact problems with the trailing-cable connections.
- Faulty trailing cable.
- Faulty carriage.
- The Printer was turned off while a test was writing to the EEROM, thus leaving corrupt information (or a communication cable was disconnected while sending information to the EEROM using software diagnostic tools).

It is generally not easy to discover the cause, due to the intermittent character of the failure modes.

If you are sure that the failure occurred just after an electricity power-cut, or after turning off the Printer during the bench run or other service tests, then the Printer is not faulty. You just need to reset the EEROM. In other cases, you need to find the cause:

- There is always an EEROM error when you switch on the Printer:
- If it is easy to reproduce a **Steady EKL** error, then try one or all of the following steps for a possible solution:

1 Configure the EEROM with the correct model ID (instructions ➧ page 4-27).

2 If you cannot configure the EEROM with the correct model ID after several attempts and you continue getting the same error code, replace the electronics module ➧ page 8-13.

- There is sometimes an EEROM error when you switch on the Printer (normally shows up as a **Steady EK** error):

1 Switch on the Printer, allow it to initialize until it has completed the power-on LED sequence, and switch off the Printer. (You are now sure that the EEROM has not been corrupted. If a **Steady EK** error appeared, it also corrects the EEROM contents, and the next time you switch the Printer ON, the error should not occur in good units.)

2 Leave the unit off for 15 minutes to detect if the EEROM is losing its information. Then turn it on again and allow it to initialize. If a **Steady EK** error appears during the initialization sequence, and the carriage does not begin to move, then the EEROM is probably faulty. Replace the electronics module.

2

System Error Codes

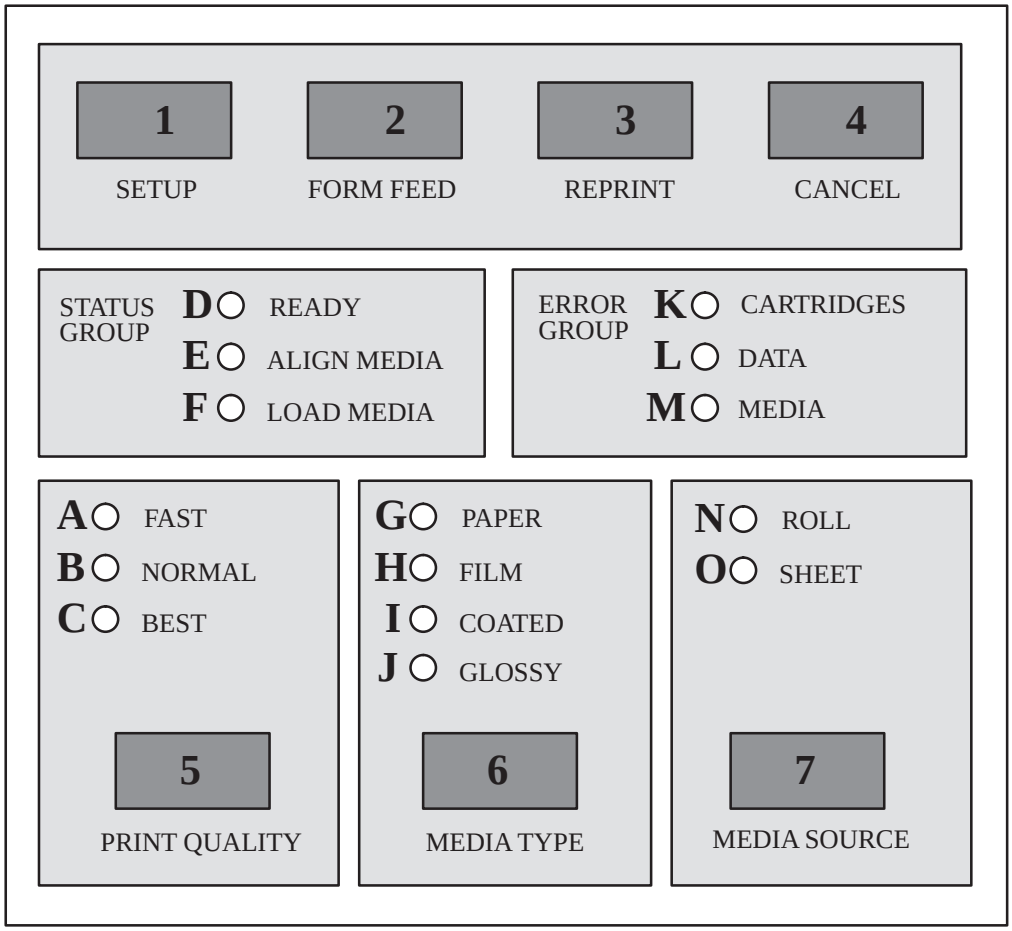
System Error Codes

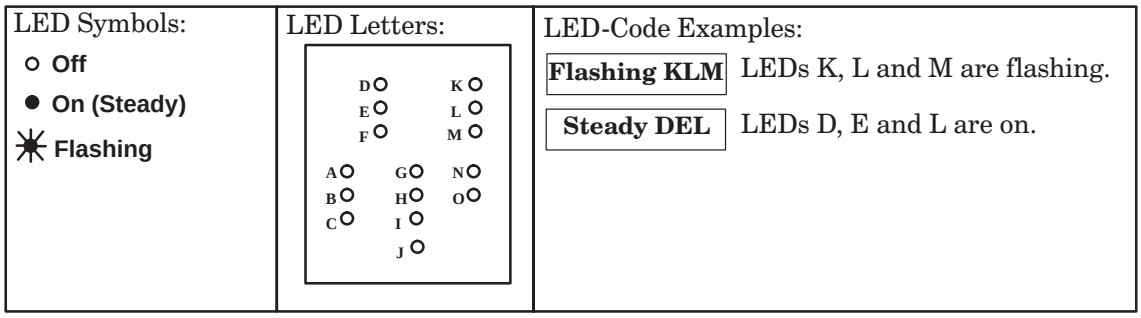
If you have an error code which is not documented in this Service Manual or you have an error which you cannot resolve, then report the error to the HP Response Center or the nearest HP Support Office. When reporting the error, have the following information ready:

- Model and Serial Number of the printer.
- Which firmware revision the printer is using.
- The complete error number.
- The Service Print (*Utilities* / *Service Tests*).
- The Current configuration sheet.
- Which software application the customer is using (name, version, etc.).
- Is the problem reproducible by you?
- Additional comments about the usage, the setting, etc..

Important Information on Troubleshooting Error Codes

Before spending time troubleshooting the problem by doing the various tests or replacing parts (which may not need replacing), check which firmware revision the printer is using or check if a service note deals with this particular problem. Some problems which occurred in earlier firmware releases may have been solved in later revisions. So if there is a new firmware revision then update the ROM SIMM before replacing any parts. Refer to Chapter 7 for the part number of the ROM SIMM.

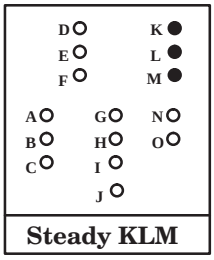




System Error codes

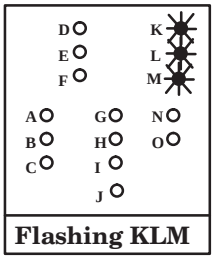
The following pages contain the possible error codes and the instructions necessary to solve the problem.

Error Codes for the HP DesignJet 430, 450C and 455CA Printers



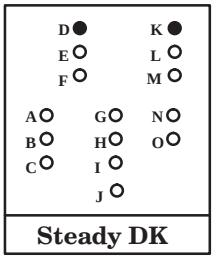
Cartridges + Data + Media:

An error which the customer could probably solve, like a paper jam, minor cartridge problem etc. In order to get more information on the error, the **CANCEL** key must be pressed which will display a **Subcode**. Use the error codes below to find information on the subcode.



Cartridges + Data + Media:

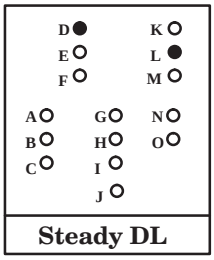
This error code indicates a severe problem which will require a Service Engineer to troubleshoot. In order to get more information on the error, the **CANCEL** key must be pressed which will display a **Subcode**. Use the error codes below to find information on the subcode.



Ready + Cartridges: The RAM SIMM test failed.

Possible causes:

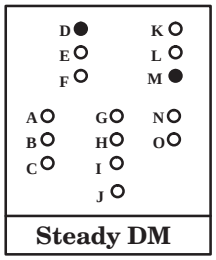
- RAM SIMM installed is not an original HP supported part.
- RAM SIMM badly connected.
- Faulty RAM SIMM.
- Faulty electronics module.



Ready + Data: Cartridge Continuity Test Failure.

Possible causes:

- Cartridges faulty or badly seated.
- Faulty or badly connected trailing cable.
- Dirty carriage flex circuit.
- Faulty carriage.
- Faulty electronics module.

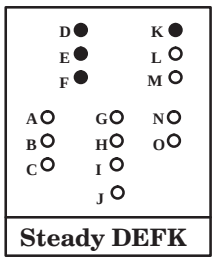


Steady DM

Ready + Media: X-axis Shutdown.

Possible causes:

- Obstacle or friction in X-axis.
- Faulty or badly connected X-axis Encoder Cable.
- Faulty media motor, or motor cable pinched.
- Faulty electronics module.



Steady DEFK

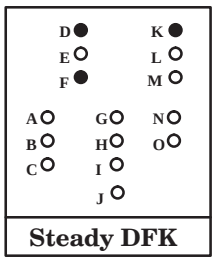
Ready + Align Media + Load Media + Cartridges: Memory or Accuracy Calibration Problems.

Possible causes:

- Not enough memory for the current plot. Add extra memory by installing a bigger RAM SIMM. Refer to Chapter 7 for the correct part numbers of the RAM SIMMs.

If this error code appeared while performing the Accuracy Calibration:

- Check that the quality of the Accuracy Calibration print is good. If the quality is bad, try to clean the black cartridge or replace it.
- Make sure that you load the Accuracy Calibration print in the correct position and orientation, and make sure that you select the correct media type.
- Make sure that the line sensor on the carriage is clean. If the Line sensor is dirty or not functioning correctly, it will have problems reading the accuracy calibration print.
- Faulty Trailing Cable.
- Faulty Carriage Assembly.
- Faulty Electronics Module.

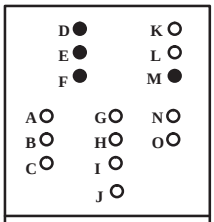


Steady DFK

Ready + Load Media + Cartridges: Mechanical Problem.

Possible causes:

- Check the Bail Assembly.
- Check the Capping Position in the Service Station.

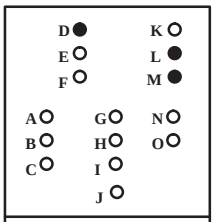


Steady DEFM

Ready + Align Media + Load Media + Media: Error in bail-lift mechanism. The bail-lift system is unable to raise or lower the bail. (It is the carriage that tests to see whether the bail is in the correct position by trying to knock against it.)

Possible causes:

- Check the bail-lift system to see if it is working correctly.
- Use the bail cycle test to help troubleshoot.

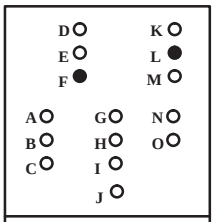


Steady DLM

Ready + Data + Media: Error in X-axis calibration.

Possible causes:

- Is X-axis calibration done? (details ➧ Chapter 5)
- Did you load media in correct orientation?
- Are the marks visible on the plot? If not, check cartridges.
- Are cartridges correctly aligned? If so, the problem may be in the electronics module, media motor or drive-roller gear; if alignment is incorrect, the problem may be in the carriage.

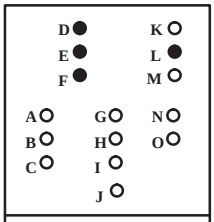


Steady FL

Load Media + Data: Firmware has a problem interacting with some of the characteristics of the print.

The Printer is using an old Firmware revision - Install the latest firmware revision.

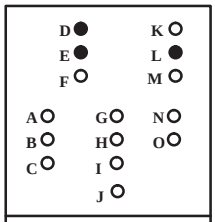
- If this error remains, report the problem to your HP Response Center. Note conditions and actions before error occurred. Include setup sheet and service configuration plot in report.



Steady DEFL

Ready + Align Media + Load Media + Data: This is a generic System Error that covers about 600 error codes.

- Report the problem to your HP Response Center. Note conditions and actions before error occurred. Include setup sheet and service configuration plot in report.

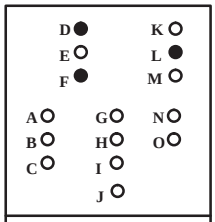


Steady DEL

Ready + Align Media + Data: Communication problem with RS-232 (Serial Port).

Possible causes:

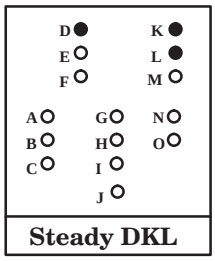
- Incorrect configuration in communications speed/protocol.
- Incorrect communications cable.
- Error in host computer.



Steady DFL

Ready + Load Media + Data: There is a communication problem between the Main PCA and the internal microprocessors.

The Main PCA is faulty - Replace the Electronics Module.

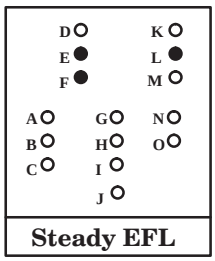


Steady DKL

Ready + Cartridges + Data: Mark Encoder not detected.

Possible causes:

- The line on the mark encoder is dirty or missing.
- Faulty or badly connected trailing cable.
- Faulty or badly connected carriage sensor.
- Faulty or badly connected X-axis Encoder Cable.
- The drive roller has shifted slightly from the expected position (mechanics). Check that the carriage sensor lights just over the white mark on the drive roller when starting.
- Faulty carriage PCA.
- Faulty X-motor.
- Faulty Y-motor.
- Faulty electronics module.

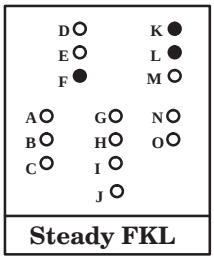


Steady EFL

Align Media + Load Media + Data: Error reading Centronics I/O

Problems in the Centronics Communications. Probably due to the bad contacts of the connector.

- If this error remains, report the problem to your HP Response Center. Note conditions and actions before error occurred. Include setup sheet and service configuration plot in report.

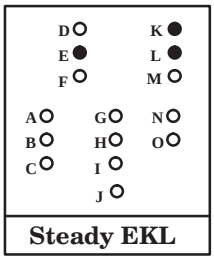


Steady FKL

Load Media + Cartridges + Data: Problems when initializing the carriage.

Possible causes:

- Carriage assembly is not present.
- Faulty or badly connected trailing cable.
- Faulty carriage PCA.
- Faulty electronics module.



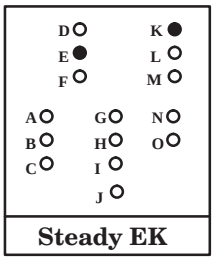
Steady EKL

Align Media + Cartridges + Data: Model ID not configured.

- After replacing a new electronics module, it must be configured either as a DesignJet 430, 450C or 455CA. If a new module does not show this error, it means that it has been installed previously and was probably calibrated with other parameters. After configuring the module Error code **Steady DLM** will appear which means the accuracy calibration must be done. After the accuracy calibration is done, all other calibrations must be done. If configuring the module does not remove the error, even after switching the Printer OFF and ON, then the EEROM in the main PCA is probably defective. Before trying to replace the electronics module try clearing the EEROM and perform all the calibrations again and see if that solves the problem.

Refer to page 4-27 in order to configure the correct model ID.

For more information ➧ page 1-8.

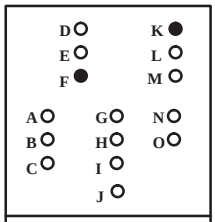


Steady EK

Align Media + Cartridges: EEROM test error.

Possible causes:

- Switch the Printer OFF and ON again and see if the error remains. If the error appears continuously, replace the Electronics Module.
- The Calibrations in the EEROM have been lost. Perform the Accuracy Calibration (refer to Chapter 5).

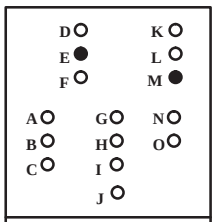


Steady FK

Load Media + Cartridges: Electronics Module Failure.

Possible causes:

- Fan faulty or badly connected.
- Faulty ROM SIMM.
- Faulty RAM SIMM.
- Faulty Electronics Module.

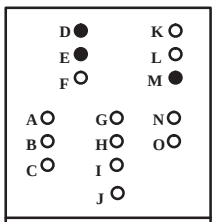


Steady EM

Align Media + Media: Y-axis Shutdown.

Possible causes:

- Problems with the Cutter Assembly.
- Clear any binding due to a media jam.
- Turn the Printer off. Manually move the carriage along the carriage axis. Check for any areas where the carriage may be binding.
- Ensure that the belt and belt pulley are in correct working order. Remove dirt from the pulley that could cause the belt to slip.
- Perform the carriage-axis test and the servo/encoder test to check for problems with the carriage motor, encoder strip, and electronics module.
- Remove dirt from the slider rod and chassis beam. Apply oil (Anderol 4068, HP part number: 6040-0858) to the carriage bushings.
- At high temperatures, and if the fan is not working correctly, the internal resistance of the motor driver may increase, causing a decrease in the voltage between the motor contacts, and a shutdown of the motor.
- Ensure that the encoder strip is not inverted, damaged or absent.
- Reconnect or replace the trailing cable ➧ page 8-8.
- Replace the carriage assembly ➧ page 8-37.

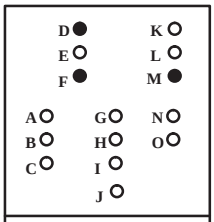


Steady DEM

Ready + Align Media + Media: Y-axis Movement Error.

Possible causes:

- Something is causing excessive friction in the Y-axis (carriage axis).
- The carriage touches the bail as it moves.

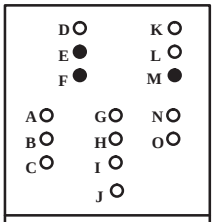


Steady DFM

Ready + Load Media + Media: Error in X-axis encoder quadrature.

Possible causes:

- Incorrect routing of the motor cables.
- Electrical noise in motors.
- Faulty motor encoder.
- Motor received an electrostatic discharge while operating.

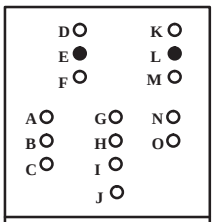


Steady EFM

Align Media + Load Media + Media: Error in Y-axis encoder quadrature.

Possible causes:

- Damaged or broken encoder strip.
- Faulty or badly connected trailing cable.
- Incorrect routing of the motor cables.
- Electrical noise in motors.
- Faulty motor encoder.
- Trailing Cable received an electrostatic discharge while the Printer was operating. Replace the Trailing Cable ➧ page 8-8.



Steady EL

Align Media + Data: Cartridge Alignment Error.

Possible causes:

- Faulty Cartridges.
- Dirty or incorrect media.
- Faulty Line Sensor.
- Faulty Carriage Assembly.
- Faulty Electronics Module.

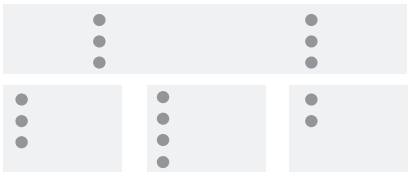
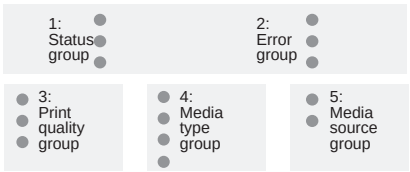
3

User Messages

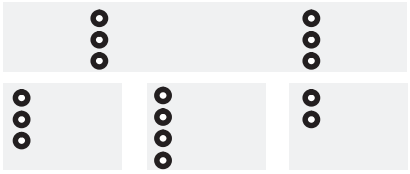
User Messages

The lights on the front panel provide the means for your day-to-day "communication" with the printer. They tell you the printer's current status and, if there is an error, the nature of the error. In order to understand the meaning of each combination of lights, you should check the table in this chapter to help you to understand the meaning. You will therefore find this table useful in troubleshooting.

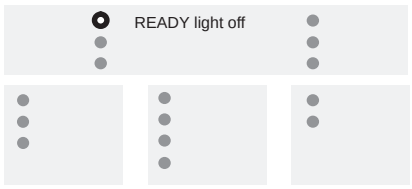
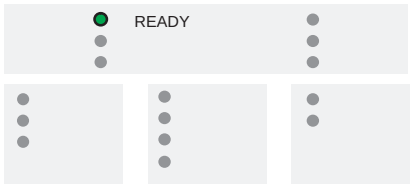
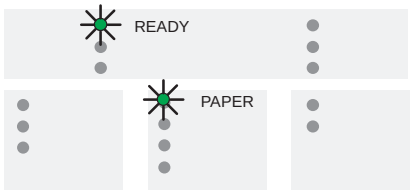
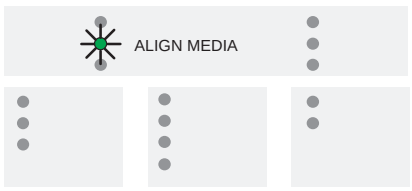
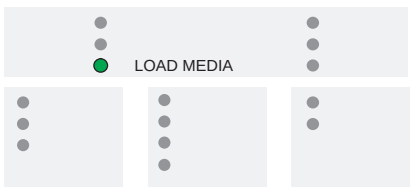
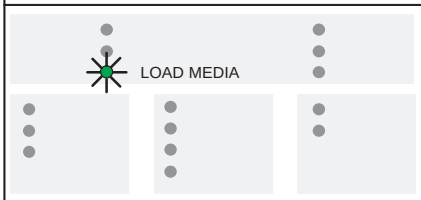
Key to table starting below

This graphic ...	means ...
	The fifteen lights on the printer's front panel. The sequence of explanations in the table is: 
	This light is ON and STEADY.
	This light is ON and FLASHING.
	This light is OFF or this is the relevant light.
	The state of this light is not relevant.

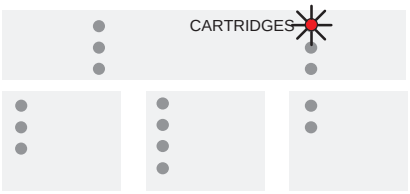
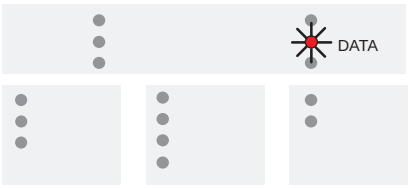
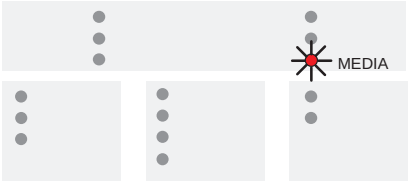
No lights

Lights	Explanation *and Action*
All lights off 	If no lights are on, you may have a power problem, or the printer may be switched off.

Status group

Lights	Explanation *and Action*
	The printer is *not* ready to print. *Check the state of the other lights and look them up in this table.*
	The printer is ready to print. *Send your print from your computer or, for a special internal print, press the appropriate key combination.*
	The printer is busy with a task or is receiving a file. *Wait.* If combined with one of the four media type group lights flashing. The printer is waiting for the media to dry. This can be terminated by pressing **Form Feed**.
	You are loading media and need to realign it, even if it seems perfectly aligned. *Lower the media lever, realign the media, and raise the media lever.*
	The printer is ready, but you need to load media. *When you are ready to print, load media.*
	The printer has a file in memory, which it is waiting to print, but no media is loaded. *Load media.*

Error Group

Lights	Explanation *and Action*
	**Either:** one of the color or black print cartridges is faulty, misplaced or missing. *Reseat or replace the cartridge.* **Or:** you have loaded a print cartridge of the wrong type for this printer. *For the correct part numbers of the cartridges supported by this printer, see Chapter 7.*
	**Either:** the current print is too large for the printer's memory. *Look on your computer screen for any error message: some drivers, for example the Microsoft Windows driver supplied with your printer, allow you to choose a different printing mode and try to send the file again. In the case of the Microsoft Windows 95 driver shipped with the printer, the relevant field is called "Process document" in the Options dialog box.* *Otherwise, you may need to install more memory to print this print. For information on available memory expansion modules, see Chapter 7.* **Or:** there is a problem with the serial interface. *The printer's settings for baud rate and parity must be the same as those of the computer sending the data.*
	**Either:** the sheet you loaded is misaligned. *Realign it again. See the Users Guide for a short tutorial on loading media.* **Or:** it is an invalid size. *For supported media sizes, refer to the Users Guide.* **Or:** the media lever is lowered. *Raise the lever.* **Or:** the cover is open when the printer is initializing. *Lower the cover.*

4

Service Tests

Introduction

This chapter explains how to use the built-in Service Tests (Diagnostics) and what to do if the tests fail. If possible, always perform a Service Test on the component that you are about to replace, just to make sure that is the component that has failed. If the test on that component passes, there is no need to replace it.

Power-On

The Printers automatically perform a series of internal self tests and mechanical initialization sequences whenever the user switches the Printer on. If a failure occurs, an error is indicated on the front-panel LEDs. You can perform a failure analysis by interpreting the LED error code. (Details ➧ Chapter 2.)

Self Test and Normal Initialization

The power-on self test and initialization procedure does the following:

1 Initializes the servo processor.

2 Initializes the main processor.

3 Tests communication between the main processor and the servo processor.

4 Tests the EEROM checksum.

5 Tests the servo-processor transfer buffer and interrupt tracking.

6 Tests the ROM checksum.

7 Causes the main processor to initialize certain firmware modules.

8 Performs a subset of the electrical service test.

9 Checks the cover sensor.

If the cover is open, nothing further happens until you close it.

10 Initializes the carriage axis (Y-axis).

11 Uses the mark encoder to check the start of the drive roller.

12 Ejects any loaded sheet.

Does not eject roll media if loaded.

13 Checks the media sensor.

14 Sets the Printer to accept media.

Which Service Test to Perform

Use the following table as a rough guide:

Assembly/Feature	Tested by ...
Bail system	Bail cycle test, Bench run, Modular Test
Carriage	Carriage test, Electrical test, Modular test
Carriage motor and drive system (including belt, pulley and slider rod)	Carriage-axis test, Bail cycle test, Modular test, Bench run
Cartridge identification	Carriage test, Modular test
Cartridge nozzles	Carriage test, Modular test
Communication between computer and Printer	Service monitor
Cover sensor	Sensors test, Modular test
DRAM SIMM	Electrical test, Power-on tests, Bench run
EEROM	Electrical test, Power-on tests, Bench run
Electronics module	Electrical test, Power-on tests, Servo/Encoder test, Sensors test, Bail cycle test, Front-panel test, Media-axis test, Carriage test, Carriage-axis test, Bench run, Modular test
Encoder strip	Carriage-axis test, Servo/Encoder test, Modular test, Bench run
Front-panel keys and LEDs	Front-panel test, Modular test
Media-axis encoder and cable	Servo/Encoder test, Media-axis test, Modular test, Bench run
Media motor and drive system (including drive roller and overdrive)	Media-axis test, Modular test, Bench run
Media sensor	Sensors test, Modular test
Pinch-arm sensor	Sensors test, Modular test
Optical sensor (on carriage)	Carriage test, Modular test
ROM	Electrical test, Power-on tests, Bench run
Service station	Bail cycle test
Trailing cable	Electrical test, Power-on tests, Bench run

Service Tests (Diagnostics)

The following is a list of all internal service tests available in the Printers. Instructions for entering service mode 1 are given on page 4-6. Instructions for entering service mode 2 are given on page 4-22.

1 Bail Cycle Test ➧ page 4-8

This tests the operation of the bail system, Service Station and the Y-axis by engaging and disengaging the bail-lift mechanism and capping/uncapping the cartridges to ensure a correct lifting action.

2 Front Panel Test ➧ page 4-9

The purpose of this test is to verify the operation of the front-panel keys and LEDs.

3 Carriage Axis (Y-axis) Test ➧ page 4-10

The purpose of this test is to verify the operation of the components of the Carriage Axis.

4 Carriage Test ➧ page 4-12

The purpose of this test is to verify the operation of the Carriage subsystems, like the Line Sensor and analog multiplexer. This test also checks the connection between the carriage flex circuit and the cartridges.

5 Sensors Test ➧ page 4-15

This tests the operation of the cover sensor, pincharm sensor and media sensor.

6 Media-Axis (X-Axis) Test ➧ page 4-16

The purpose of this test is to verify the operation of the components of the Media Axis.

7 Bench Run ➧ page 4-18

This test has been designed to be used during the manufacturing stage and not in the field. do not at anytime enter this test when troubleshooting the Printer.

8 Modular Test ➧ page 4-19

This test has been created to check the interaction between various components of the Printer. It combines the following tests:

- Carriage-axis test.
- Carriage test.
- Media-axis test.
- Front-panel test.
- Sensors test.

9 Electronics Test ➧ page 4-21

The purpose of this test is to verify the operation of the FIBIS Column address and the shuffler.

10 Bail Test ➧ page 4-23

This tests the operation of the bail system, Service Station and the Y-axis by engaging and disengaging the bail-lift mechanism and capping/uncapping the cartridges.

11 Electrical Test ➧ page 4-24

This tests the operation of some of the electrical components of the electronics module.

12 Servo/Encoder Test ➧ page 4-25

The servo/encoder test performs the following:

- Media-axis encoder test: Verifies the operation of the servo loop (media-axis feedback).
- Carriage-axis encoder test: Verifies the operation of the servo loop (carriage-axis feedback).
- Records the maximum friction detected in the EEROM. You can view this information on the service configuration plot.

13 Service Monitor ➧ page 4-26

The service monitor is useful to find out why the Printer is not plotting what you expect it to plot. It enables you to read the graphics-language instructions that the Printer is receiving from the computer. Instead of plotting the drawing that you send, the Printer prints the beginning and end of the code that would otherwise have been used to plot the drawing.

14 EEROM Model ID Configuration Procedure ➧ page 4-27

This procedure is necessary if the Printer needs to be reconfigured as a DesignJet 430, 450C or 455CA.

15 Service Configuration Plot ➧ page 4-29

Gives a service report of the Printer.

16 Clearing the EEROM ➧ page 4-32

Instructions on how to clear the EEROM.

Service Mode 1

Service Mode 1 contains tests that **do not** need a complete initialization of the Printer. This means if there is a system error in normal mode, it is still possible to enter into Service Mode 1. Also, the Sensors are disabled in Service Mode 1, which means it will not be possible to load media. The only time that the sensors will be functional is during the Sensors Test.

THE COVER SENSOR IS DISABLED WHEN IN SERVICE MODE 1. IF THE CARRIAGE IS MOVING IT WILL NOT STOP IF THE COVER IS OPENED. BE VERY CAREFUL NOT TO PUT YOUR HANDS INSIDE.

Some of the tests in service mode **1** send test information to the printer's serial port. To view the information perform the procedure on page 4-7.

The Electronics Test is continuously done in the background during Service Mode 1. If you are viewing information via the serial port, you will see output similar to the following:

```
Test Mode EE test: 0
Test Mode EE test: 1
..........
```

Stopping a Test

The service tests are continuously repeated until you stop them. To exit a test, press the **Cancel and Media Source** keys (some tests may take a short while before exiting). To exit Service Mode 1, you must power OFF the Printer.

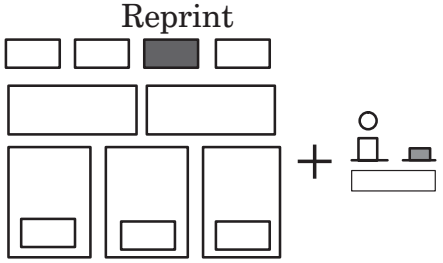
Entering Service Mode 1

1. While holding the **Reprint** key down, switch the Printer ON.
2. Once the the LEDs begin to light up one by one, release the **Reprint** key.

   The printer performs the electrical power-on tests and then the fan turns on and remains on. All LEDs remain off for a few seconds. Then, all LEDs begin to flash, waiting for you to perform a test.

   *If there are any system failures during Service Mode **1** initialization, the Sheet LED (**LED O**) will be lit. This failure means that the Electronics Module has failed and needs to be replaced.*

SERVICE MODE 1



Viewing Test Output via the Serial Port

Some of the tests in service mode **1** send test information to the printer's serial port. To view the information via the Serial Port:

Using Windows 3.1

1. Turn the printer and PC OFF.
2. Connect the Printer to the PC using a serial interface cable and switch the PC ON.
3. Select the **Terminal** Icon in the **Accessories Group** in Windows.
4. In **Terminal**, select **Settings** and then select **Communications** from the pull down menu.
5. Make sure you use the following configuration:
   - Baud Rate = 9600
   - Data Bits = 8
   - Stop Bits = 1
   - Parity = None
   - Flow Control = None
   - Connector = Select the Communications Port that you are using.
6. Select **OK** and Switch the Printer ON.
7. Perform the service tests on the Printer.

Using an HP Palmtop PC

1. Use HP cable number F1015-80002 and adapter number 5181-6640 to connect the Palmtop to the Printer's serial interface port.

   Both cable and adaptor are included in the HP F1021B Connectivity Pack.
2. Turn the Printer on in service mode **1**.
3. Turn the Palmtop on.
4. Open the **Data Comm** application on the Palmtop and press **MENU**.
5. Move to the **Connect** menu and press **ENTER**.
6. Ensure that **Settings** are the same for both Printer and Palmtop.
7. Again move to the **Connect** menu and press **ENTER**.
8. With **Connect** highlighted in the **Connect** menu, press **ENTER**.
9. Perform the service tests on the Printer.

To stop communication between the Printer and the Palmtop, highlight **Hangup** in the **Connect** menu and press **ENTER**.

Bail Cycle Test

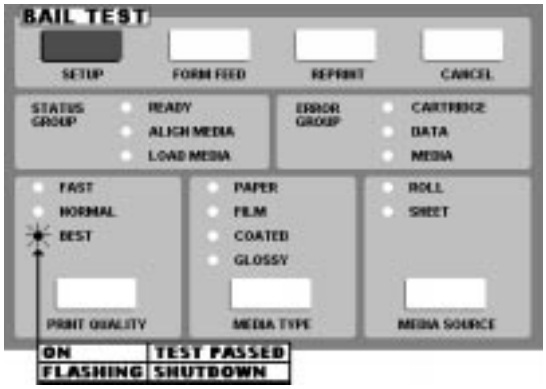
This tests the operation of the bail system, Service Station and the Y-axis by engaging and disengaging the bail-lift mechanism and capping/uncapping the cartridges.

The test will perform the number of cycles as specified in the EEROM, but if the EEROM is cleared this test will not function.

This Test has been designed to be used during the manufacturing stage and not in the field. If the Bail needs to be tested, please use the Bail Test in Service Mode 2. If a system error prevents you from entering into Service Mode 2, you may try this test instead.

Perform the Bail Cycle test as follows:

1. In service mode **1,** press **Bail Cycle Test** (Setup Key).
2. The test will start and the Carriage will move out of the Service Station and activate the engaging lever which causes the Bail Assembly to be gently raised and then lowered.
3. The test repeats the number of cycles as defined in the EEROM, unless you press the **Cancel and Media Source** keys.
4. If the test passes, the Best LED (**LED C**) will light up after the first cycle.
5. If there is a shutdown in the Y-axis, the Best LED (**LED C**) will start to flash.
6. If the Printer does not raise the Bail Assembly then the test has failed.



If the bail fails the test, try replacing the following component:

1. *Bail-lift mechanism* ➧ *page 8-28.*

Front Panel Test

The purpose of this test is to verify the operation of the front-panel keys and LEDs.

Perform the Front Panel test as follows:

1 In service mode **1**, press **Front Panel Test** (Form Feed Key).

If you are viewing information via the serial port, you will see output similar to the following:

```
1. - Front Panel Test
```

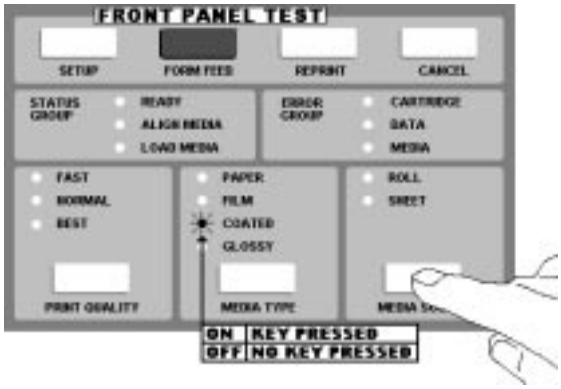
*This message only informs you that the test has started, and a message will **not** appear if the test passes or fails.*

2 The test will start and all the LEDs will flash for 2 seconds after which they will all be turned OFF. Check that all LEDs are functioning correctly when they flash.

3 To check that the front-panel keys function correctly, press them one by one. Each time a key is pressed, the Coated LED (**LED I**) will be lit.

4 If a key is not functioning, the Coated LED (**LED I**) will remain OFF.

5 The test continuously repeats itself until you press the **Cancel and Media Source** keys.



If the test fails, to resolve the problem, try one of the following:

1 *Check that the cable for the Front Panel Assembly is connected to the Electronics Module. Also make sure that the cable is NOT damaged or twisted.*

2 *Replace the Front Panel Assembly* ➧ *page 8-12.*

3 *Replace the Electronics Module* ➧ *page 8-13.*

Carriage Axis (Y-axis) Test

The purpose of this test is to verify the operation of the components of the Carriage Axis.

This Service Mode does not include carriage-axis initialization. If the carriage starts somewhere out of the Service Station, it will hit the right-hand side of the Printer when the test begins, and the test will fail. Always make sure that the carriage is parked in the service station before starting this test.

Perform the Carriage Axis test as follows:

1. Make sure that the carriage is parked in the service station.
2. In service mode **1**, press **Carriage-Axis Test** (Reprint Key).
3. The test will start and the carriage moves towards the right-hand side of the printer. It then begins cycles of moving from side to side over the drive roller.
4. If the test passes, the Fast LED (**LED A**) will light up after the first cycle.

   If you are viewing information via the serial port, you will see output similar to the following:

```
2. - Y-AXIS TEST
Test Mode Y-axis cycle: 26.67 speed and 66 pwm
Test Mode Y-axis cycle 50.00 speed and 100 pwm
Test Mode Y-axis cycle: 26.67 speed and 68 pwm
.............
```

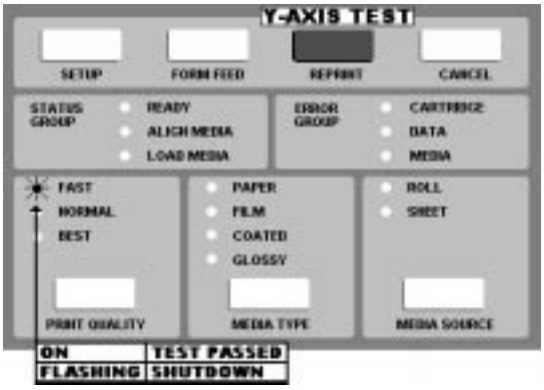
5. If there is a Y-axis shutdown, the Fast LED (**LED A**) will start to flash.

   If you are viewing information via the serial port, you will see output similar to the following:

```
2. - Y-AXIS TEST
Test Mode Y-axis cycle: 26.67 speed and 0 pwm
Test Mode Error: 2 on y-axis test
```

6. The test continuously repeats itself until you press the **Cancel and Media Source** keys.

The test is continued on the next page.



If the test fails, to resolve the problem, try one of the following:

1 Clear any binding due to a media jam.

2 Turn the Printer off. Manually move the carriage along the carriage axis. Check for any areas where the carriage may be binding.

3 Ensure that the belt and belt pulley are in correct working order. Remove dirt from the pulley that could cause the belt to slip.

4 Remove dirt from the slider rod and chassis beam. Apply oil (Anderol 4068, HP part number: 6040-0858) to the carriage bushings.

5 At high temperatures, and if the fan is not working correctly, the internal resistance of the motor driver may increase, causing a decrease in the voltage between the motor contacts, and a shutdown of the motor.

6 Ensure that the encoder strip is not inverted, damaged or absent.

7 Reconnect or replace the trailing cable ➧ page 8-8.

8 Replace the carriage assembly ➧ page 8-37.

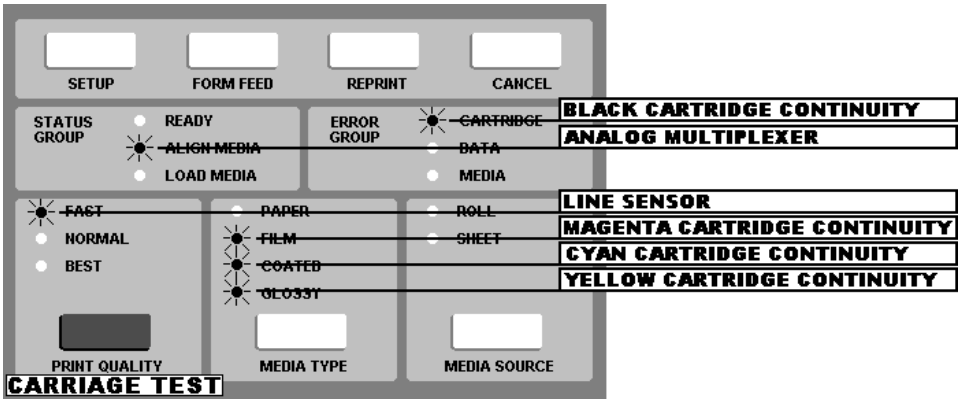
Only replace one component at a time and perform the test again before replacing another component. Using this procedure you will be able to determine exactly which component failed.

Carriage Test

The purpose of this test is to verify the operation of the Carriage subsystems, like the Line Sensor and analog multiplexer. This test also checks the connection between the carriage flex circuit and the cartridges.

Perform the Carriage test as follows:

1. In service mode **1**, press **Carriage Test** (Print Quality Key).
2. The test will start and all the LEDs will turn OFF. There will be no movement in the Printer and you must wait for the Front-Panel to indicate if the test has passed or failed.
3. Refer to the following figure to check which LED is associated with which test. If the test **passes**, the following LEDs will be lit (**ON**). If the test **fails**, the following LEDs will be flashing:



*If you are viewing information via the serial port, you will see output similar to the following if the **Test Passes**:*

```
4. - Carriage Test
 0x57c7c350 (carrPCBTest): Forcing use of R10X method for Calvin: 13643  1960
 0x57c7c350 (carrPCBTest): Forcing use of R10X method for Yellow: 11361  1953
 0x57c7c350 (carrPCBTest): Forcing use of R10X method for Cyan: 11361  1953
 0x57c7c350 (carrPCBTest): Forcing use of R10X method for Magenta: 11361  1953
Pen BLACK continuity: WORKS
Pen CYAN continuity: WORKS
Pen MAGENTA continuity: WORKS
Pen YELLOW continuity: WORKS
Pen BLACK has 1cd4 identification.
Pen CYAN has 400 identification.
Pen MAGENTA has 1f00 identification.
Pen YELLOW  has 1900 identification.
Optical sensor samples: 253 255 255 254 253 252 252 250 249 248 247
246 245 244 243 241
Optical Sensor: WORKS
Carriage MUX  : WORKS
Pen BLACK continuity: WORKS .....
```

The test is continued on the next page.

*If you are viewing information via the serial port, you will see output similar to the following if the **Test Fails**:*

```
4. - Carriage Test
0x57c7c350 (carrPCBTest): Forcing use of R10X method for Calvin: 13643  1960
0x57c7c350 (carrPCBTest): Forcing use of R10X method for Yellow: 12160  1899
0x57c7c350 (carrPCBTest): Forcing use of R10X method for Cyan: 12160  1899
0x57c7c350 (carrPCBTest): Forcing use of R10X method for Magenta: 12160  1899 Pen BLACK
continuity: FAILS
Pen CYAN continuity: FAILS
Pen MAGENTA continuity: FAILS
Pen YELLOW continuity: FAILS
Pen BLACK has 3ffe identification.
Pen CYAN has 3ffe identification.
Pen MAGENTA has 3ffe identification.
Pen YELLOW  has 3ffe identification.
Optical sensor samples: 215 252 243 232 221 208 194 179 166 151 135
119 103 87 71 54
Optical Sensor: WORKS
Carriage MUX  : FAILS
Pen BLACK continuity: FAILS ..............
```

4 The test continuously repeats itself until you press the **Cancel and Media Source** keys.

Cartridge Continuity Test Failure

If any cartridge Continuity test fails, to resolve the problem, try one of the following:

1. *Remove the failing Cartridge and clean the flex contacts on the Carriage and the Cartridge. Reseat the Cartridge and try the test again.*
2. *Replace the Cartridge of the relevant failing color and perform this test again.*
3. *Check and if necessary replace the Trailing Cable* ➧ *page 8-8.*
4. *Replace the Carriage Assembly* ➧ *page 8-37.*
5. *Replace the Electronics Module* ➧ *page 8-13.*

Only replace one component at a time and perform the test again before replacing another component. Using this procedure you will be able to determine exactly which component failed.

The test is continued on the next page.

Line Sensor Test Failure

If the Line Sensor test fails, to resolve the problem, try one of the following:

1. ***Line sensor incorrectly calibrated:*** *The accuracy calibration includes calibration of the line sensor on the carriage. You must use HP Matte film when performing the accuracy calibration (Details ➧ Chapter 5). Otherwise the line sensor will have problems loading some types of media.*
2. *Check and if necessary replace the Trailing Cable ➧ page 8-8.*
3. *Replace the Carriage Assembly ➧ page 8-37.*
4. *Replace the Electronics Module ➧ page 8-13.*

Only replace one component at a time and perform the test again before replacing another component. Using this procedure you will be able to determine exactly which component failed.

Analog Multiplexer Test Failure

If the Analog Multiplexer test fails, to resolve the problem, try one of the following:

1. *Check and if necessary replace the Trailing Cable ➧ page 8-8.*
2. *Replace the Carriage Assembly ➧ page 8-37.*
3. *Replace the Electronics Module ➧ page 8-13.*

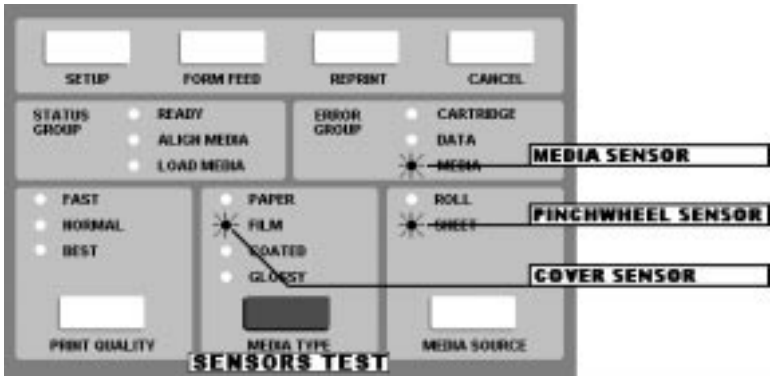
Only replace one component at a time and perform the test again before replacing another component. Using this procedure you will be able to determine exactly which component failed.

Sensors Test

This tests the operation of the cover sensor, pincharm sensor and media sensor.

Perform the Sensors test as follows:

1. In service mode **1**, press **Sensors Test** (Media Type Key).
2. Activate the necessary sensor and check that the relevant LED status changes (ON/OFF). Refer to the following figure to check which LED is associated with which sensor.
3. The test continuously repeats itself until you press the **Cancel and Media Source** keys.



If you are viewing information via the serial port, you will see output similar to the following:

```
5. - SENSORS TEST
```

*This message only informs you that the test has started, and a message will **not** appear if the test passes or fails.*

If the test fails, to resolve the problem, try one of the following:

1. *If the cover sensor fails, check that the front-panel assembly is correctly connected to the electronics module. Try replacing the front-panel assembly.*
2. *If the Pincharm sensor fails, check that the sensor cable is correctly connected to the electronics module. Try replacing the pincharm sensor.*
3. *If the Media sensor fails, check that the sensor cable is correctly connected to the electronics module. Try replacing the overdrive assembly (the media sensor is included as part of the overdrive assembly).*
4. *Replace the Electronics Module* ➧ *page 8-13.*

Only replace one component at a time and perform the test again before replacing another component. Using this procedure you will be able to determine exactly which component failed.

Media-Axis (X-Axis) Test

The purpose of this test is to verify the operation of the components of the Media Axis.

Perform the Media-Axis test as follows:

1. In service mode **1**, press **Media-Axis Test** (Media Load Button).
2. The test will start and the drive roller rotates in steps, each equivalent to one swath advance.
3. If the test passes, the Glossy LED (**LED J**) will light up after the first cycle.

   If you are viewing information via the serial port, you will see output similar to the following:

```
3. - X-AXIS TEST
Test Mode X-Axis Cycle: 92 pwm
Test Mode X-Axis Cycle: 65 pwm
Test Mode X-Axis Cycle: 66 pwm
..............
```

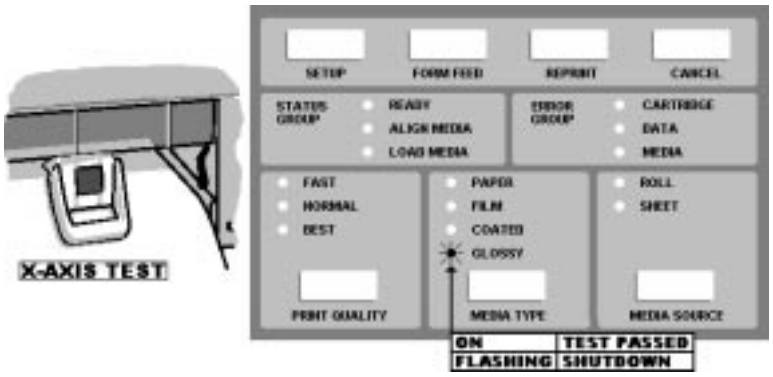
4. If there is a shutdown, the Glossy LED (**LED J**) will start to flash after the first cycle.

   If you are viewing information via the serial port, you will see output similar to the following:

```
3. - X-AXIS TEST
Test Mode X-Axis Cycle: 79 pwm
Test Mode X-Axis Cycle: 115 pwm
Test Mode X-Axis Cycle: 127 pwm
Test Mode Error: 1 on X-axis test
```

5. The test continuously repeats itself until you press the **Cancel and Media Source** keys.

The test is continued on the next page.



If the test fails, to resolve the problem, try one of the following:

1. *Switch OFF the Printer and manually moving the carriage along the slider rod, check for obstacle or friction in the X-axis.*
2. *Check for a faulty or badly connected X-axis Encoder Cable.*
3. *Replace media motor* ➧ *page 8-23.*
4. *Replace electronics module* ➧ *page 8-13.*

Only replace one component at a time and perform the test again before replacing another component. Using this procedure you will be able to determine exactly which component failed.

Bench Run

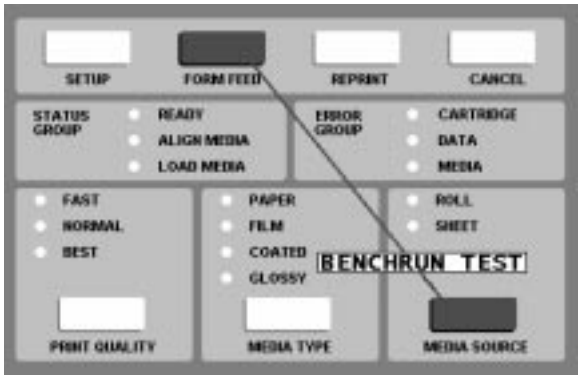
The bench run is a routine that each Printer performs before it leaves the manufacturing site. It attempts to filter out Printers that could have an early breakdown due to a fault in manufacturing. The bench run tests the operation of the electronics, carriage-axis system, media-axis system, bail-lift mechanism, and service station.

The bench run is performed at the manufacturing site by sending special commands to the Printer and then pressing the indicated front-panel keys.

If the Printer is switched OFF during the Bench Run, the Bench Run will be resumed at exactly the same point before the Printer was switched OFF, until the Bench Run is completed.

THIS TEST HAS BEEN DESIGNED TO BE USED DURING THE MANUFACTURING STAGE AND NOT IN THE FIELD. DO NOT AT ANYTIME ENTER THIS TEST WHEN TROUBLESHOOTING THE PRINTER.

1 The way to enter to **Bench Run** is to press the **Media Source** and **Form Feed** keys in Service Mode **1**. If these keys are accidently pressed, **you must immediately EXIT the Bench Run by switching OFF the Printer and powering ON again while pressing the Print Quality and Media Source keys**.



Modular Test

This test has been created to check the interaction between various components of the Printer. It combines the following tests:

- Carriage-axis test.
- Carriage test.
- Media-axis test.
- Front-panel test.
- Sensors test.

This Service Mode does not include carriage-axis initialization. If the carriage starts somewhere out of the Service Station, it will hit the right-hand side of the Printer when the test begins, and the test will fail. Always make sure that the carriage is parked in the service station before starting this test.

If one part of the test fails, the other parts continue regardless.

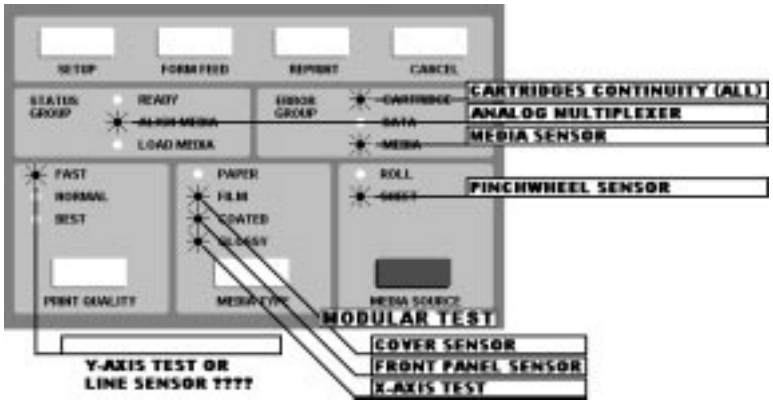
Perform the Modular test as follows:

1 Make sure that the carriage is parked in the service station.

2 In service mode **1**, press **Modular Test** (Media Source Key).

3 The printer first performs the Front-panel Test and once it is fully completed (once all the keys are pressed) then continues with the rest of the above tests in parallel.

4 Refer to the following figure to check which LED is associated with which test. If the test **passes**, the following LEDs will be lit (**ON**). If the test **fails**, the following LEDs will be flashing:



The test is continued on the next page.

5 The test continuously repeats itself until you press the **Cancel and Media Source** keys.

*If you are viewing information via the serial port, you will see output similar to the following if the **Test Passes**:*

```
1. - FRONT PANEL TEST
2. - Y AXIS TEST
3. - X AXIS TEST
4. - CARRIAGE TEST
5. - SENSORS TEST
Test Mode X–axis cycle : 87 pwm.
0x57c7c350 (carrPCBTest): Forcing use of R10X method for Calvin: 13643  1960
0x57c7c350 (carrPCBTest): Forcing use of R10X method for Yellow: 11361  1953
0x57c7c350 (carrPCBTest): Forcing use of R10X method for Cyan: 11361  1953
0x57c7c350 (carrPCBTest): Forcing use of R10X method for Magenta: 11361  1953
Test Mode Y-axis cycle : 26.67 speed and 68 pwm.
Test Mode X-axis cycle : 67 pwm.
Test Mode Y-axis cycle : 50.00 speed and 100 pwm.
Test Mode X-axis cycle : 66 pwm.
Test Mode Y-axis cycle : 26.67 speed and 66 pwm.
Test Mode X-axis cycle : 65 pwm.
Test Mode Y-axis cycle : 50.00 speed and 98 pwm.
Pen BLACK continuity: WORKS
Pen CYAN continuity: WORKS
Test Mode X-axis cycle : 64 pwm.
Pen MAGENTA continuity: WORKS
Pen YELLOW continuity: WORKS
Pen BLACK has 1cd4 identification.
Pen CYAN has 400 identification.
Pen MAGENTA has 1f00 identification.
Pen YELLOW has 1900 identification.
Optical sensor samples: 255 255 255 255 255 254 254 253 253 252 252 251
251 250 250 249
Optical Sensor: WORKS
Encoder sensor: WORKS
Pen BLACK continuity: WORKS
Test Mode Y-axis cycle : 26.67 speed and 68 pwm
.............
```

*The result of the Encoder sensor test is only reported via the serial output and not via the front-panel. In order to perform the encoder sensor test, you must move the carriage **slightly** so that the encoder sensor can detect the change in status. If the carriage is not moved at all, the Encoder Sensor test will always fail. If the carriage is moved and ONLY the Encoder Sensor test fails, then you need to replace the Carriage Assembly* ➧ *page 8-37.*

If any of the tests fail, refer to the individual test documented in this chapter for the correct troubleshooting procedure.

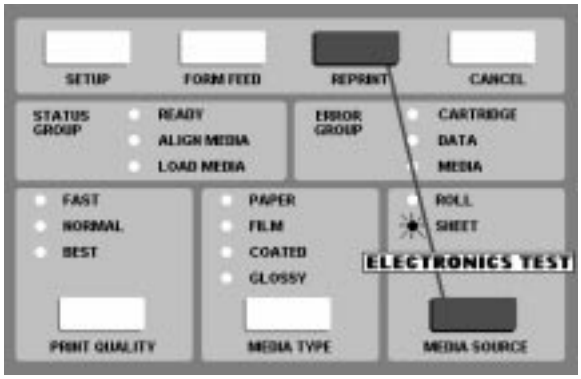
Electronics Test

The purpose of this test is to verify the operation of the FIBIS Column address and the shuffler.

THIS TEST HAS BEEN FOUND TO BE VERY UNSTABLE DUE TO SOME INTERACTIONS BETWEEN SOME OF THE COMPONENTS OF THE ELECTRONICS MODULE. IT IS SOMETIMES IMPOSSIBLE TO EXIT THIS TEST WITHOUT SWITCHING OFF THE PRINTER.

Perform the Electronics test as follows:

1. In service mode **1**, press **Electronics Test** (Media Source and Reprint Keys).
2. The test will start and all the LEDs will turn OFF. There will be no movement in the Printer and you must wait for the Front-Panel to indicate if the test has passed or failed.
3. If the test passes, the Sheet LED (**LED O**) will light up.
4. If the test fails, the Sheet LED (**LED O**) will start to flash.
5. The test continuously repeats itself until you press the **Cancel and Media Source** keys.



If the test fails, try replacing the following component:

1. *Electronics Module* ➧ *page 8-13.*

Service Mode 2

Service Mode 2 contains tests that **do** need a complete initialization of the Printer. This means if there is a system error in normal mode, it is **NOT** possible to enter into Service Mode 2. If possible try entering into Service Mode 1 and performing the tests there.

The tests in service mode **2** DO NOT send test information to the printer's serial port. For some of the tests you will need to print the Service Configuration Plot (Details ➧ page 4-29) in order to check the results.

Stopping a Test

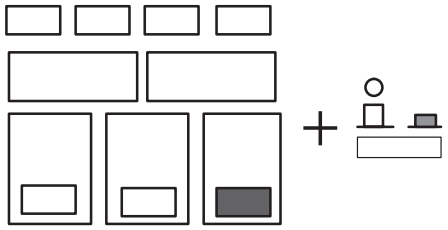
The service tests are continuously repeated until you stop them. To exit a test, press any of the front-panel keys. To exit Service Mode 2, you must power OFF the Printer.

Entering Service Mode 2

1. While holding the **Media Source** key down, switch the printer ON.
2. Once the the LEDs begin to light up one by one, release the **Media Source** key.

   The printer performs the electrical power-on tests and initializes the mechanics as in normal user mode.

   When you are in Service Mode 2, All the LEDs will go off except the ones that have been selected. Once inside a test, all the LEDs, except for the LEDs in the Error Group, will begin to flash.



Media Source

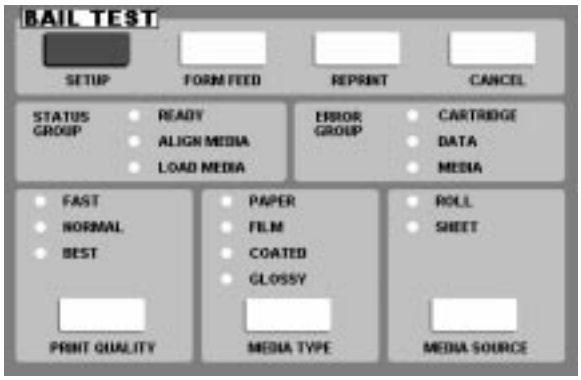
SERVICE MODE 2

Bail Test

This tests the operation of the bail system, Service Station and the Y-axis by engaging and disengaging the bail-lift mechanism and capping/uncapping the cartridges.

Perform the Bail test as follows:

1. In service mode **2**, press **Bail Test** (Setup Key).
2. The test will start and the Carriage will move out of the Service Station and activate the engaging lever which causes the Bail Assembly to be gently raised and then lowered.
3. If the Printer does not raise the Bail Assembly then the test has failed.
4. The test continuously repeats itself until you press any of the front-panel keys.



If the bail fails the test, try replacing the following component:

1. *Bail-lift mechanism* ➧ *page 8-28.*

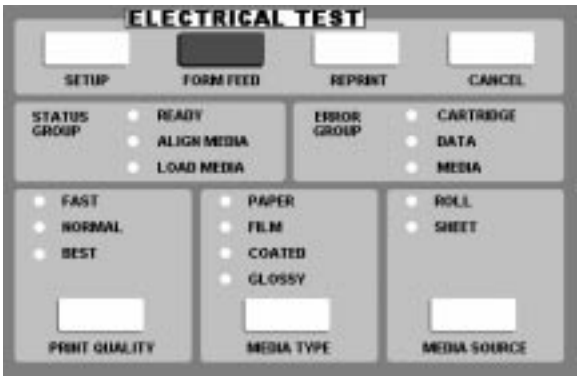
Electrical Test

This tests the operation of some of the electrical components of the electronics module.

THIS TEST HAS BEEN FOUND TO BE VERY UNSTABLE DUE TO SOME INTERACTIONS BETWEEN SOME OF THE COMPONENTS OF THE ELECTRONICS MODULE. IT IS SOMETIMES IMPOSSIBLE TO EXIT THIS TEST WITHOUT SWITCHING OFF THE PRINTER.

Perform the Electrical test as follows:

1. In service mode **2**, press **Electrical Test** (Form Feed Key).
2. The test will start and the Printer will check some of the electrical parts.
3. If the test fails, an error code will appear on the front-panel. Refer to Chapter 2 in order to correctly troubleshoot the failure.



Servo/Encoder Test

The servo/encoder test performs the following:

- Media-axis encoder test: Verifies the operation of the servo loop (media-axis feedback).
- Carriage-axis encoder test: Verifies the operation of the servo loop (carriage-axis feedback).
- Records the maximum friction detected in the EEROM. You can view this information on the service configuration plot.

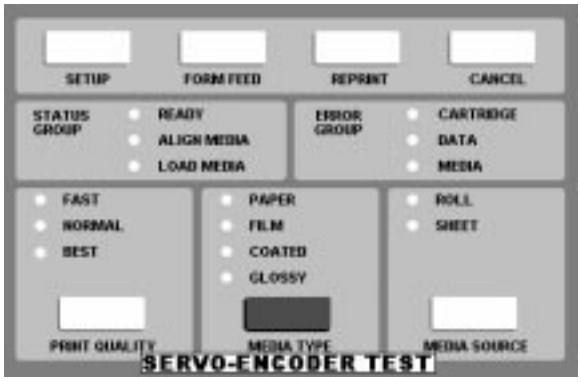
Perform the Servo/Encoder test as follows:

1 In service mode **2**, press **Servo/Encoder Test** (Media Type Key).

2 The test will start and there will be slight movements in the X and Y-axis. After every 5 movements, the direction of the movement will change in both axis. The maximum PWM of both axis will be saved in the EEROM.

3 To view the results of the test, you must print the Service Configuration Plot (Print Quality and Media Type keys).

4 If the test fails, an error code will appear on the front-panel. Refer to Chapter 2 in order to correctly troubleshoot the failure.



Service Monitor (Data Display)

The service monitor is useful to find out why the Printer is not plotting what you expect it to plot. It enables you to read the graphics-language instructions that the Printer is receiving from the computer. Instead of plotting the drawing that you send, the Printer prints the beginning and end of the code that would otherwise have been used to plot the drawing.

You need a basic knowledge of the graphics-language instructions to be able to pick out the important information from the printed code.

Perform the Service Monitor as follows:

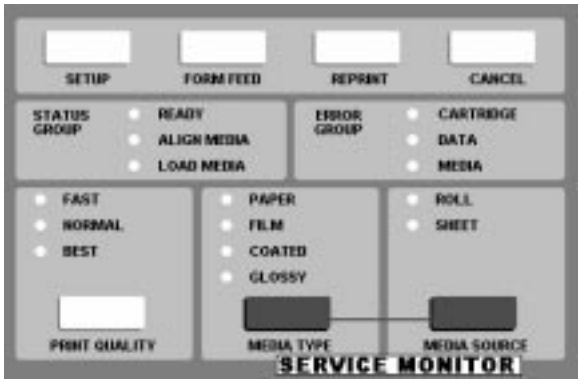
1. In service mode **2**, load a sheet of media (A3 size or B size minimum) in portrait orientation.
2. Press **Service Monitor** (Media Type and Media Source Keys).
3. Send the file from the computer through the serial or parallel ports.

   *The **Ready** LED begins to flash.*
4. Wait until the **computer** has indicated that it has sent the file.

   *The **Ready** LED continues to flash.*
5. While the **Ready** LED is flashing, press **Service Monitor** (Media Type and Media Source Keys) again.

   *The **Ready** LED continues to flash. After a minute, the fan turns on, and the carriage moves to the right side of the Printer.*

   Instead of printing the drawing that you sent, the Printer prints the first and last Kbytes of the code for that drawing. The code is printed in hexadecimal and ASCII format. (If the total size of the file(s) sent is not bigger than one Kbyte, only the first buffer is printed.) The Printer exits the service monitor mode if the file(s) sent contain PJL universal exit language.



EEROM Model ID Configuration Procedure

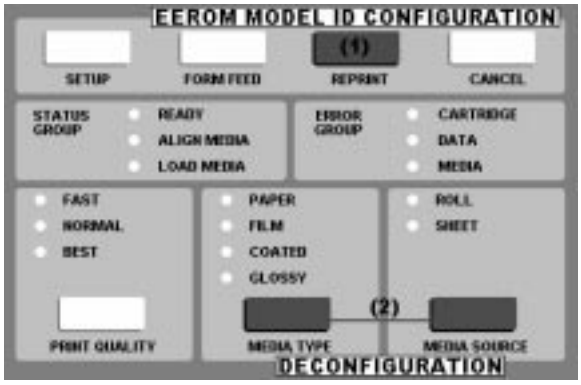
The EEROM model ID configuration procedure only needs to be carried out if:

- A pre-configured board is being reused.
- The current board is incorrectly configured to the wrong model ID.
- The Printer shows an unconfigured model ID system error (**Steady EKL**).

It is very rare that these situations will ever occur.

Configure the Printer model ID as follows:

1. Remove the right-end cover ➧ page 8-11.
2. Disconnect the media motor encoder cable from the main PCA (connector ENC X).
3. Turn the Printer ON while holding the **Reprint** key down.
4. Press the **Media Source** and **Media Type** keys together to enter the **deconfiguration mode**. The Fast, Normal and Best LEDs (**LEDs ABC**) will light up.



5. Using a suitable tool, short-circuit pins 1 and 2 (the first two pins on the right) of the media motor encoder connector (ENC X). The Cartridges, Data and Media LEDs (**LEDs KLM**) should light up as you short-circuit the two pins.
6. Once you have short-circuited the two pins, the Fast, Normal and Best LEDs (**LEDs ABC**) should light up again.
7. Press the **Cancel** and **Media Source** keys together to exit the **deconfiguration mode**.

The instructions are continued on the next page.

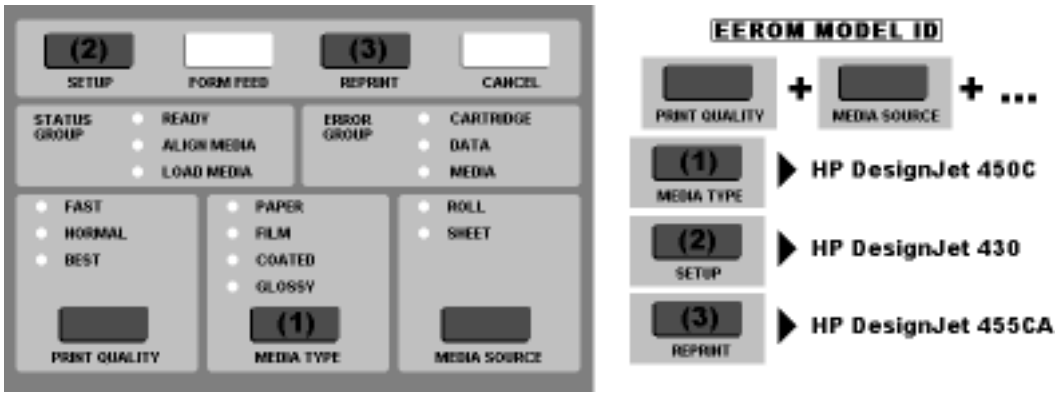
8 Configure the Printer with the correct model ID as follows:

Only one opportunity is given to perform this procedure and there is no indication that it was successful.

If the Printer is to be configured as a DesignJet 450C (Color) Printer, hold the **Media Source** key down and press the two **Color Configuration (Print Quality + Media Type)** keys at the same time.

If the Printer is to be configured as a DesignJet 430 (Monochrome)Printer, hold the **Media Source** key down and press the two **Mono Configuration (Print Quality + Setup)** keys at the same time.

If the Printer is to be configured as a DesignJet 455CA (LFP) Printer, hold the **Media Source** key down and press the two **LFP Configuration (Print Quality + Reprint)** keys at the same time.



9 Turn the Printer OFF.

10 Reconnect the media motor encoder cable to the main PCA (connector ENC X).

11 Turn the Printer ON. After initializing, error code “DLM” will appear because the Accuracy Calibration must still be performed.

12 Press the **Cancel** key and print the Demo Plot to check if the Printer has been correctly configured as a DesignJet 430, 450C or 455CA.

*If the Printer is still incorrectly configured then Error Code “EKL” will be displayed on the front panel. Turn the Printer OFF and perform the EEROM Model ID configuration procedure again from step **2**.*

13 Perform the accuracy calibration (refer to Chapter 5).

Service Configuration Plot

The service configuration plot contains the following information:

DesignJet 4XX Service Configuration Plot

Firmware Release: X.XX.XX

SPROC release: X.X *(Servo-Processor Code revision number.)*

EEROM Contents

EEROM CONTENTS
(This is for the Printer design engineers to interpret.)

NOTE: All EEPROM Parameters are since last EEROM Reset.

Number of Power Cycles:	19
Number of Color Plots:	13
Number of Black Plots:	15
Number of Pens:	7 6 6 6
Factory Spittoon:	0% used
Number of Bail Errors:	0
Number of System Errors:	2
Last System Error:	0x00000550 (errno = 0x3c0001)
Last System Error at file media_load.c line 2810	
Bench Run:	
Bench Run Maximum Y-Axis (Carriage-Axis) PWM:	127
Bench Run Maximum X-Axis (Media-Axis) PWM:	87
Encoder-Tests Maximum Y-Axis (Carriage-Axis) PWM:	62
Encoder-Tests Maximum X-Axis (Media-Axis) PWM:	62

X-axis Calibration: Amp1 = 7.467, Phase1 = –0.450, Amp2 = 8.956, Phase2 = 2.325, Factor = –0.000500

Printing the Service Configuration Plot

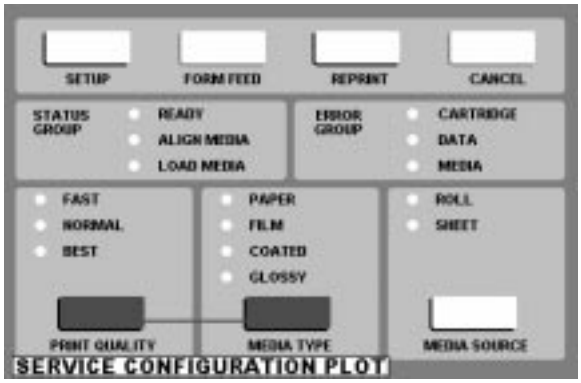
To print the service configuration plot:

1. In service mode **2**, load a sheet in portrait orientation.

   In normal mode, load a sheet in portrait orientation.

   The service configuration plot can be plotted without the need to enter the service mode. This is because the customer will be requested to plot the service configuration plot and he will be given the following instructions to plot it without entering the service mode.

2. When the **Ready** LED lights up, press the **Print Quality and Media Type** keys.
3. The **Ready** light begins to flash and then remains on (steady).
   The Printer plots the service configuration plot and ejects the media.
4. Unload the media.



Interpreting the Service Configuration Plot

The parameters on the Service Configuration Plot can help you to troubleshoot the Printer more effectively. Here is a short description of the all the parameters.

Number of Power Cycles

How many times the Printer has been powered ON.

Number of Color Plots

How many color plots have been produced since the EEROM was last erased.

Number of Black Plots

How many mono plots have been produced since the EEROM was last erased.

Number of Pens

The number of times each cartridge has been replaced. The numbers refer to (from left to right): Cyan, Magenta, Yellow, Black.

Factory Spittoon

The estimated level of ink in the spittoon. This level will be incorrect if the EEROM has been cleared.

Number of Bail Errors

How many shutdowns there have been because of the Bail-life mechanism.

Number of System Errors

How many System Errors have occurred.

Last System Error

The last System error that occurred.

This information might be requested in the event of an escalation in order to understand any problems.

Last System Error Data

Information on exactly which line of the firmware the error occurred in.

This information might be requested in the event of an escalation in order to understand any problems.

Bench Run

Whether the Bench Run has been performed.

Bench Run Maximum Y-Axis (Carriage-Axis) PWM

This Value should be **less** than 144. Typical Value = 90 - 100.

Bench Run Maximum X-Axis (Media-Axis) PWM

This Value should be **less** than 100. Typical Value = 60 - 70.

Encoder -Tests Maximum Y-Axis (Carriage-Axis) PWM

This Value should be **less** than 144. Typical Value = 90 - 100.

Encoder -Tests Maximum X-Axis (Media-Axis) PWM

This Value should be **less** than 100. Typical Value = 60 - 70.

X-axis Calibration

This shows the information related to the Accuracy Calibration.

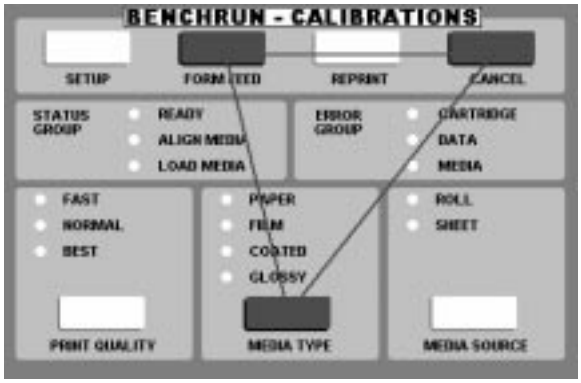
This information might be requested in the event of an escalation in order to understand any problems.

Clearing the EEROM

CAUTION If you clear the calibration parameters, you will then need to perform the Printer calibrations. (Details ➧ chapter 5.) Clearing the EEROM also resets the factory spittoon value to 0% used. Keep in mind that the value printed on the service configuration plot may greatly underestimate the amount of ink in the spittoon.

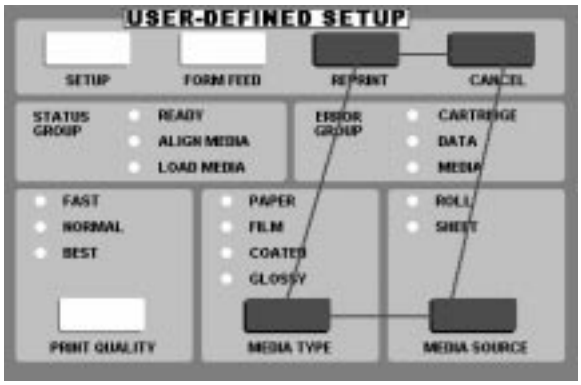
Clearing Just the Benchrun and Calibration Parameters

1. Switch the Printer OFF.
2. While holding down the **Form Feed, Cancel** and **Media Type** keys down, switch the Printer ON.
3. Once the the LEDs begin to light up one by one, release the keys.



Clearing Just the User-Defined Setup Parameters

1. Switch the Printer OFF.
2. While holding down the **Reprint, Cancel, Media Type** and **Media Source** keys down, switch the Printer ON.
3. Once the the LEDs begin to light up one by one, release the keys.

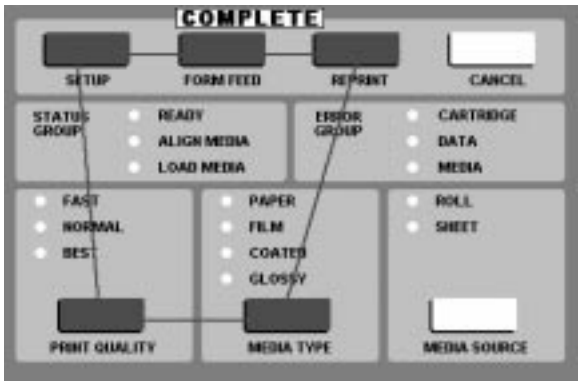


Clearing All Parameters

1 Switch the Printer OFF.

2 While holding down the **Setup, Form Feed, Reprint, Print Quality** and **Media Type** keys down, switch the Printer ON.

3 Once the the LEDs begin to light up one by one, release the keys



5

Service Calibrations and Adjustments

Calibrations

The only Calibration that the Printer requires is the **Accuracy Calibration** which must be performed under certain conditions.

Accuracy Calibration

Purpose

The accuracy calibration (X-axis calibration) procedure is used to correct the end-point accuracy of the media axis. The carriage axis does not require calibration and is used to calibrate the media axis. The accuracy calibration also includes calibration of the optical line sensor on the carriage.

The accuracy calibration is also used to correct the error of the X-axis movement to avoid banding.

Perform the accuracy calibration whenever the:

- EEROM is erased.
- Electronics module is replaced.
- Drive roller is removed or replaced.
- Media (X-axis) motor is removed or replaced.
- Drive-roller gear is removed or replaced.
- Cartridge carriage is replaced.
- Mark encoder is removed or replaced.
- Optical sensor is removed or replaced.

What is the End-Point Accuracy Specification ?

The end-point accuracy specifies how accurately a Printer can draw a given length of line. The end-point accuracy specification for the Printers is ± 0.38 mm (0.015 in) or ± 0.2% of the specified vector length, whichever is greater, at 23°C (73°F), at 50-60% relative humidity on HP matte film. Use the following formula to calculate the Printer's accuracy:

$$\frac{\text{Measured length} - \text{Desired length}}{\text{Desired length}} \times 100 = \%\text{Error}$$

What can Affect the End-Point Accuracy ?

Various part tolerances inside the Printer affect the accuracy (in particular the drive roller). Other outside influences include:

- Media thickness. Thicker media creates longer lines.
- Media expansion. As the media grows, so do the lines.
- The application software may be instructing the Printer to draw an incorrect line length.
- The EEROM has been cleared. The accuracy constants are stored in this non-volatile memory component.

Before Performing the Accuracy Calibration

1. Under normal environmental conditions and on HP Matte Film D/A1-size media, plot a drawing that contains two "X" marks nominally positioned 500 mm (19.69 in.) apart.
2. Measure the distance between the centers of the "X" marks on the plot.

   Accuracy calibration is needed if this distance is not 500 mm (19.69 in) ±1 mm (0.04 in).

   If the measured accuracy, media thickness, or environmental conditions vary greatly from the factory standards, recalibrate the Printer by continuing with the following procedure.

Performing the Accuracy Calibration

1. Place a sheet of HP Matte Film over the top of the Printer for 10 minutes to let the sheet stabilize to the environmental conditions.

   Use a sheet of approximate size A1 or D.

   You must use HP Matte Film. *Otherwise the optical sensor on the carriage will be calibrated incorrectly, and the Printer will have problems loading some types of media.*
2. Enter into **Service Mode 2**, by powering ON the Printer while holding down the **Media Source** key.
3. Set the **Media Type** on the front panel to **Coated Paper**.
4. Load the film, with the matte (dull) side down, in portrait orientation into the Printer.
5. When the **Ready** LED lights up, press **Reprint** key.

   *The **Ready** LED begins to flash and the Printer takes several minutes to plot the calibration plot (see Figure 1). The Printer ejects the sheet, and the **Load Media** LED lights up.*
6. Unload the sheet.
7. Wait until the ink on the sheet is dry.
8. Cut the sheet along the dotted line and reload the sheet **facedown** into the Printer, in the direction indicated by the arrows on the calibration plot (see Figure 2).

   *The **Ready** LED begins to flash. The Printer takes less than 10 minutes to: read the calibration sheet; calculate the calibration data; save the data in the EEROM; and eject the sheet.*
9. Unload the sheet.

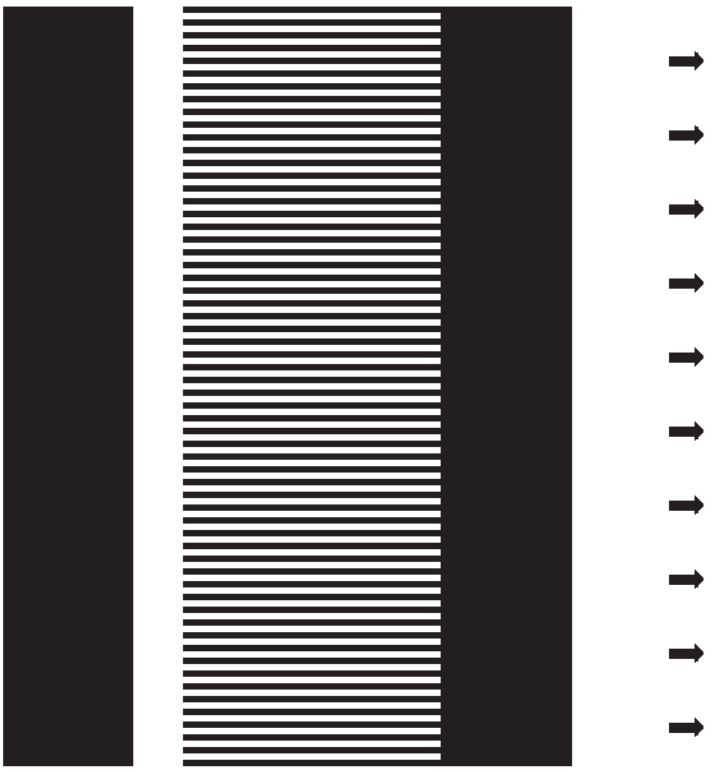


Figure 1

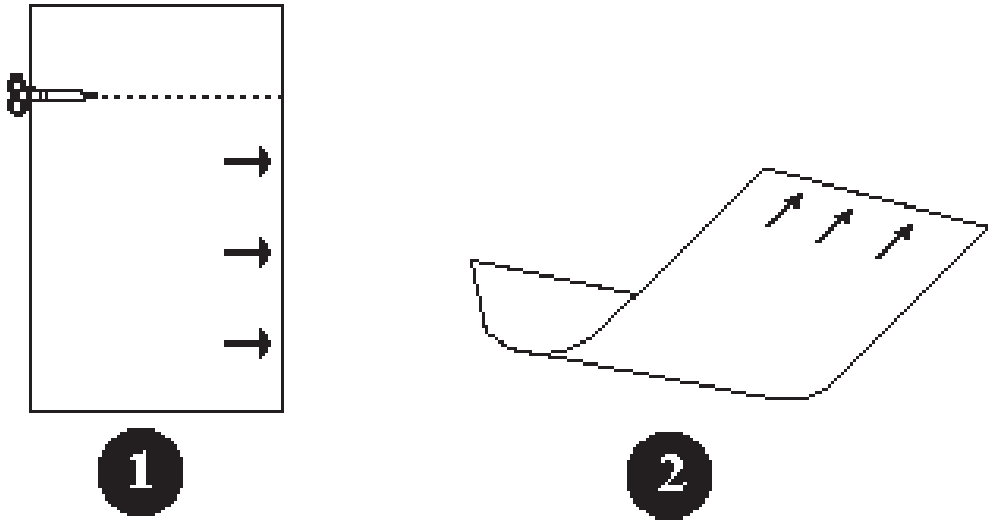


Figure 2

Adjusting the Carriage-to-Media Distance

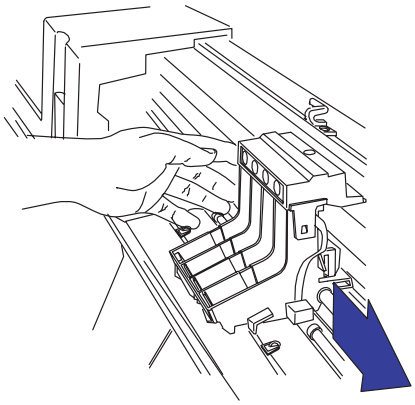
It is very important that the distance between the carriage and the media is within certain limits. If the distance between the cartridge nozzles and the media is **too small**, ink smears on the media. If the distance is **too big**, unwanted spray appears around the ink dots, and vertical lines are not straight. (A big distance may also prevent the carriage from actuating the bail lever.)

Whenever you remove the Drive Roller or the Cartridge Carriage, take care to reinstall them correctly. Incorrect installation may result in the carriage being too close or too far from the media. For the correct installation procedure ➧ Chapter 8.

To check the carriage-to-media distance

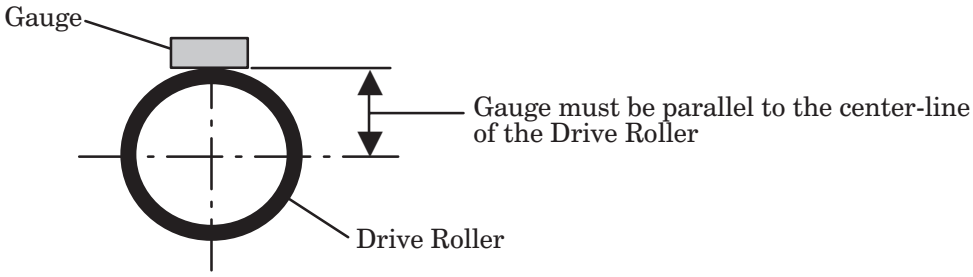
A *Gauge* (included with the carriage assembly) has been produced to check the carriage-to-media distance to make sure it is within the tolerances allowed. Use this gauge to check the carriage-to-media distance as follows:

1. Open the top cover.
2. Move the carriage out of the service station.

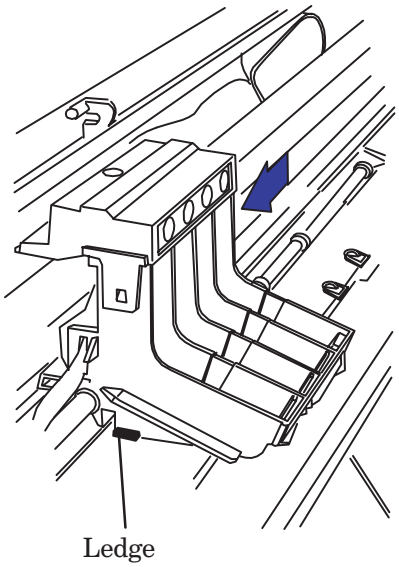


3. Remove the **Yellow** cartridge from the carriage.
4. Check the gauge to determine the *GO* and *NO GO* sides:

5. Place the gauge on the drive roller on the left-hand side of the carriage, with the *GO* side facing the carriage, in the position shown below:



6 With the gauge held in place, manually move the carriage over the *GO* side of the gauge. The ledge, indicated below, should easily pass over the *GO* side of the gauge.



WARNING

Make sure that the carriage is in the down position at all times when passing over the gauge.

If the ledge **does not** go over the *GO* side of the gauge, adjust the carriage-to-media distance ➧ page 5-7.

7 Remove the gauge and replace it on the drive roller with the NO GO side facing the carriage.

8 With the gauge held in place, manually try to pass the carriage over the *NO GO* side of the gauge. The ledge, indicated above, should NOT pass over the *NO GO* side of the gauge.

If the ledge **does** go over the *NO GO* side of the gauge, adjust the carriage-to-media distance ➧ page 5-7.

9 Replace the **Yellow** cartridge in the carriage.

10 Move the carriage back into the service station.

11 Close the top cover.

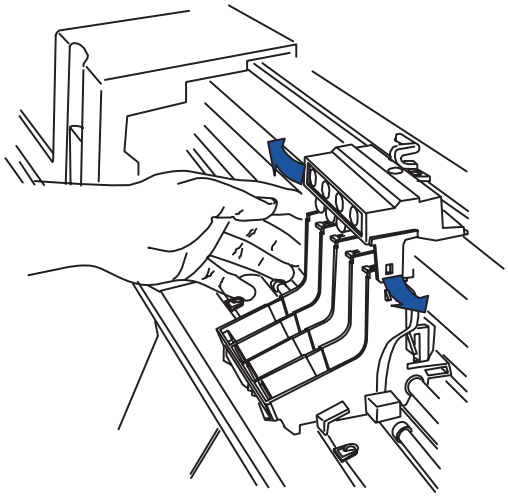
To adjust the carriage-to-media distance

You will need to adjust the carriage-to-media distance if:

- The ledge on the carriage **did not** pass over the *GO* side of the gauge. This means that the carriage is positioned too close to the drive roller.
- The ledge on the carriage **did** pass over the *NO GO* side of the gauge. This means that the carriage is positioned too far from the drive roller.

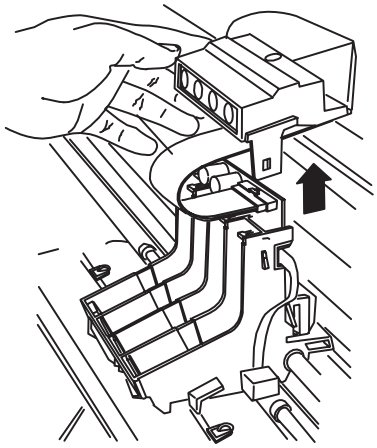
Adjust the carriage-to-media distance as follows:

1 Release the two indicated clips on the top of the cartridge carriage by pulling them slightly outwards.

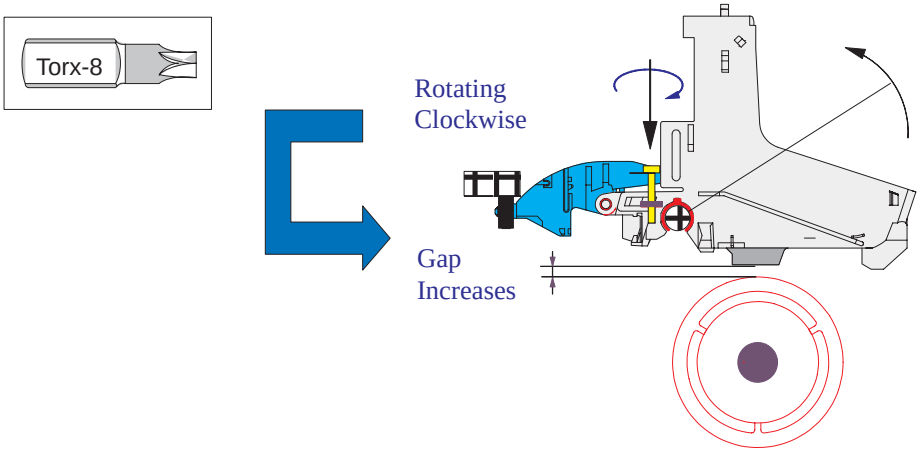


Take care neither to cut yourself on the encoder strip, nor to damage the strip.

2 Pull the top of the carriage up.



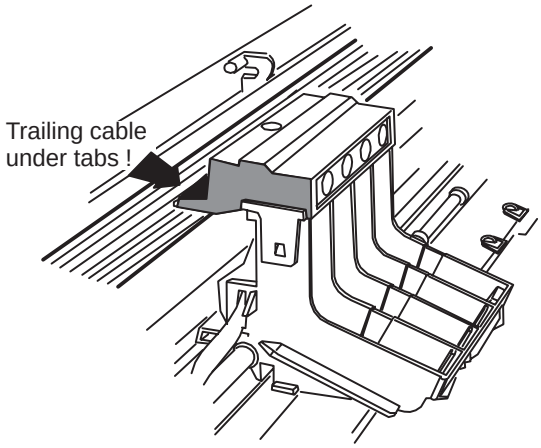
3 Tighten or loosen the indicated screw on the carriage. This will adjust the carriage angle on the slider rod, thus increasing or decreasing the carriage-to-media distance.



4 Check the carriage-to-media distance ➧ page 5-5.

5 Reinstall the top of the carriage.

6 Check the trailing cable to make sure that it is positioned under the plastic tabs at the back of the carriage cover, and not above them.



Otherwise, the Printer will not be able to load media.

6

Print Quality

Print Quality Troubleshooting Checklist

When faced with a Print Quality problem, use the following checklist as a guide in troubleshooting the problem:

1 Problem reproduction

- Reproduce the problem that the customer is seeing using their original settings.

2 Printer configuration:

- Print Mode: Set to "Best" (in the printer and in the drivers).
- Select the correct media setting when loading the media.

3 Hardware check list

- Check if the latest version of the firmware is installed. If not Install the latest firmware revision.

4 Cartridges

Cartridge Troubleshooting Process:

- If you don't have any samples yet, reproduce the original problem with the correct printer settings.
- Print the Print-Quality Plot using the exact settings and Media that the Customer used when faced with the Print Quality problem ➧ page 6-3.

Cartridge Alignment:

- Perform the Cartridge Alignment procedure (details ➧ User's Guide).

5 Media

- Make sure that you use HP or HP-approved media.
- Select the correct media type through the front-panel when loading it.

6 Driver print quality configuration:

To clarify if the reason of the problem is related with the print mode defined with the Non-HP Driver try the following:

- Print the same sample using the Non-HP driver and their normal media.
- Print the internal demo or print the Print Quality Plot (details ➧ page 6-3) using HP Media and configuring the printer as indicated previously.

If the output obtained using the HP Solution is good and the one obtained through the 3rd party solution is bad, HP support organization should:

- Communicate to the customer that the problem is not in the printer and that he should address it through the 3rd party vendor support structure.

7 Accuracy Calibration (details ➧ Chapter 5)

- Perform "Accuracy calibration" using HP Matte Film.

Print-Quality Plot

Introduction

Whenever a Print Quality problem appears, it is advisable to print the Print-Quality Plot to help diagnose the problem. The Print-Quality Plot will help you differentiate between possible cartridge errors and other problems such as incorrect front-panel selection, driver or RIP configuration or mechanical problems.

To achieve the best performance from the printer, advise the customer to only use genuine HP accessories and supplies, whose reliability and performance have been thoroughly tested to give trouble-free performance and best-quality prints.

Using the Print-Quality Plot

1. The size of the Print-Quality Plot is A3 and B so you must use media (roll or sheet) that is this size or larger.
2. Use the same type of media that the customer was using when the Print quality problem was discovered.
3. Study each of the test patterns in the order listed to determine the type of Print quality problem.
4. If the customer was reporting problems of Print Quality using non-HP media and after the Print-Quality Plot test the same quality problems appear, advise the customer to use genuine HP media. Repeat the Print-Quality Plot test using genuine HP Media.

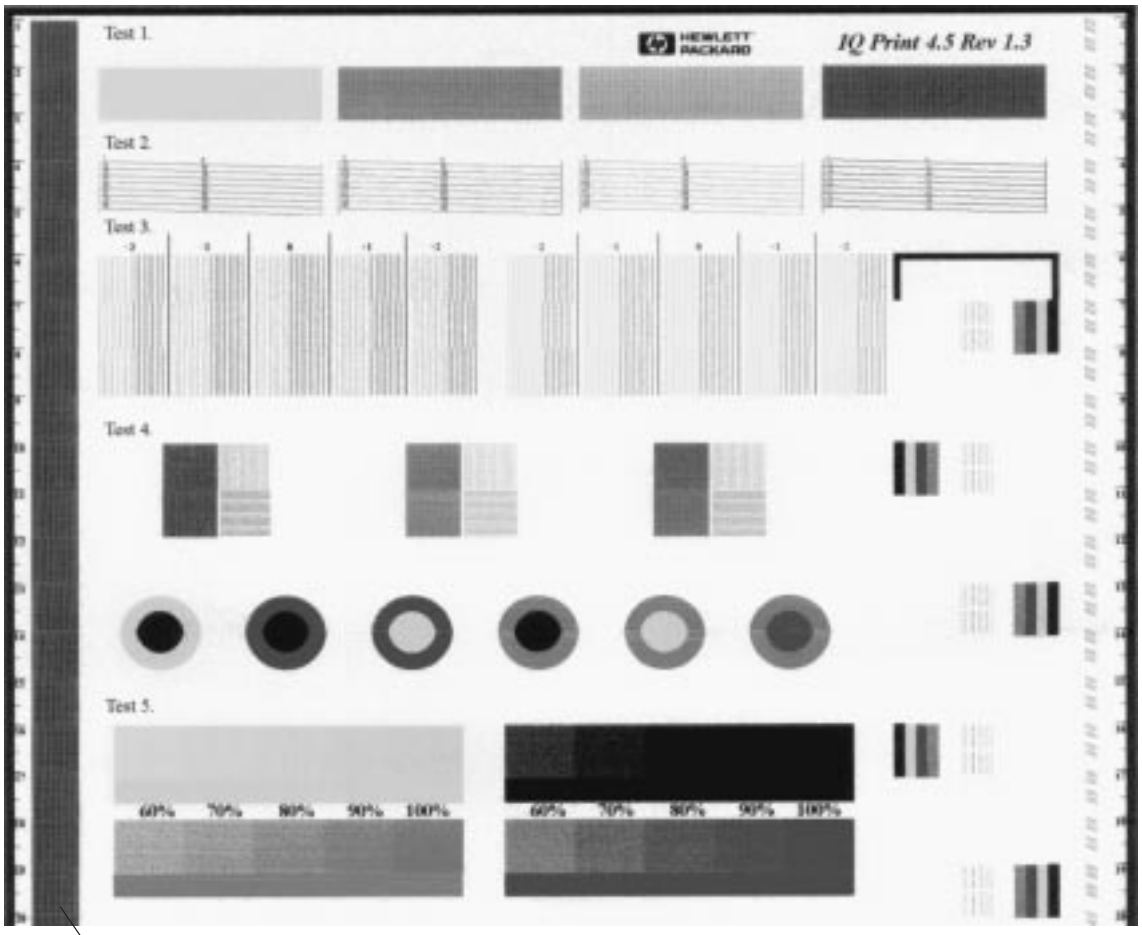
Printing the Print-Quality Plot

1. Before printing the plot, in Normal mode, set the **Media Type** and **Print Quality** on the front panel to the settings that you want to test.
2. Load a sheet of media in portrait orientation.
3. When the **Ready** LED lights up, press the **Form Feed** and **Media Source** keys together.

   *The **Ready** light begins to flash, and the media moves slightly forward. The carriage moves to the right side of the Printer, and the fan turns on. The Printer plots the print-quality plot and ejects the media.*
4. Unload the media.

Print-Quality Plot

The print-quality plot for the HP DesignJet 430/450C/455CA is represented below. Use a 10X magnifier to help identify plot-quality problems.



Analyzing the Print-Quality Plot

The Print-Quality Plot will contain six patterns as follows:

1 Cartridge Warm Up (See below).

2 Nozzle Print Test (See below).

3 Vertical Line Straightness Test ➧ page 6-7.

4 Color Alignment Quality Test ➧ page 6-9.

5 Color Variation Test ➧ page 6-11.

6 Banding Test ➧ page 6-12.

Test Pattern 1: *Cartridge Warm-up*

This pattern warms-up the cartridges, leaving them in a perfect operating condition. You can ignore this pattern and continue with Test Pattern 2.

Test Pattern 2: *Nozzle Print Test*

In this test all the 96 nozzles of each cartridge are tested. For each of the 4 colors you will see the numbers 1 to 90 over the diagonally stepped lines in increments of 5. These numbers correspond to the nozzle number that prints each step.

There are two cartridge nozzle errors (see Figure 1):

- Nozzles not printing.
- Nozzles misdirected.

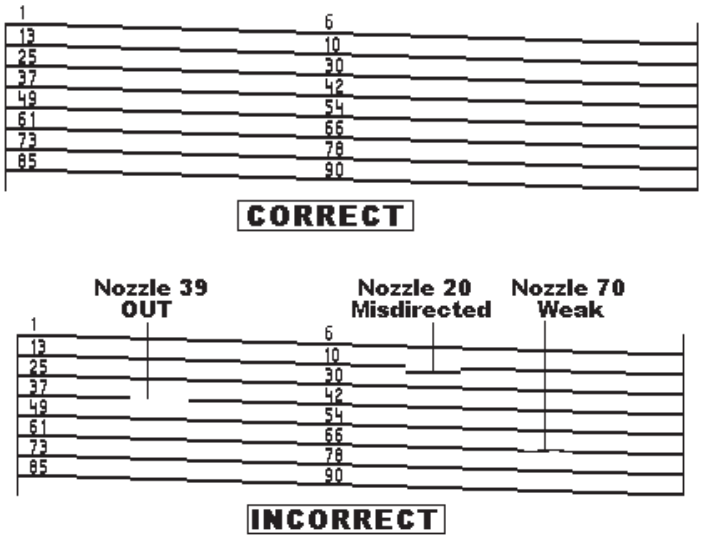


Figure 1

Nozzles not printing (Nozzles Out)

1 If the diagonally stepped lines are broken in one or more steps it indicates that this specific nozzle(s) may be blocked and are not printing.

Nozzles misdirected

If all the stepped lines are visible in the pattern, then all the cartridge nozzles are printing. However the nozzles could still be misdirected, possibly due to some dried ink around the nozzles.

1 In the top pattern, marked with numbers, if the diagonally stepped lines are not equally positioned in every step it indicates that this specific nozzle(s) may be misdirected.

Nozzles Problem 1: Some cartridge nozzles, in any one color, are not printing.

Nozzles Problem 2: Cartridge nozzles are misdirected in any one color.

Corrective Action: Try the following steps:

1 Prime the Cartridges and print the Print-Quality Plot again to see if there has been any improvement.

2 If the error is still present, replace the failing cartridge and print the Print-Quality Plot again.

3 If the error continues try the following:

- Replace the Trailing Cable ➧ page 8-8.
- Replace the Carriage Assembly ➧ page 8-37.
- Replace the Electronics Module ➧ page 8-13.

Only replace one component at a time and check if the problem has gone before replacing another component. Using this procedure you will be able to determine exactly which component failed.

Test Pattern 3: *Vertical Line Straightness Test*

Vertical-line straightness is a measure of the horizontal distance between the segments of a vertical line plotted in two consecutive swaths. If the Printer is working correctly, this distance should be less than 2 mils (see Figure 2)

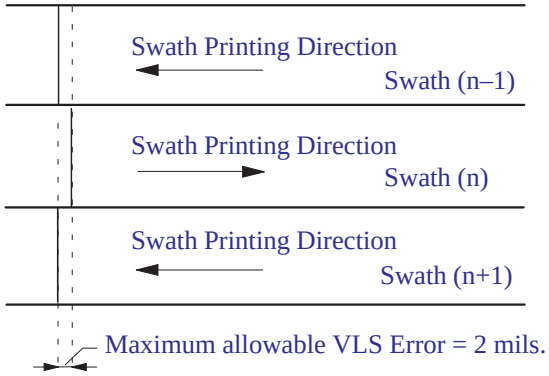


Figure 2

Customer Expectations

Although the VLS specification satisfies the expectations of most customers, some may complain even when the Printer is working within this specification. If the VLS error is already less than 2 mils, do not try to improve it.

The VLS error is composed of two parts (see Figure 3):

- Theta-Zeta error
- Bidirectional error

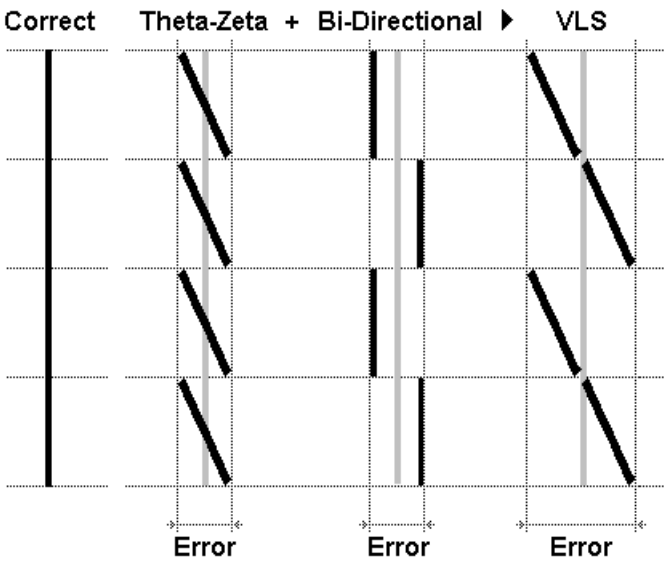


Figure 3

Bidirectional Error

You can see an example of a bidirectional error in Figure 3. If you print the same plot using a unidirectional print mode, the error should not appear.

This error can occur for various reasons, including:

- Incorrect distance between nozzles and media. (Adjustment ➧ chapter 5.)
- Encoder-strip slots are damaged or dirty.
- Dirt on the pulley is causing the belt to slip.
- Friction between carriage bushings and slider rod:

Theta-Zeta Error

You can see an example of a Theta-Zeta error in Figure 3. They appear when the rows of nozzles on a cartridge are not perpendicular to the carriage axis (Y-axis).

This error can occur for various reasons, including:

- Badly seated cartridge.
- Faulty cartridge.
- Faulty carriage.

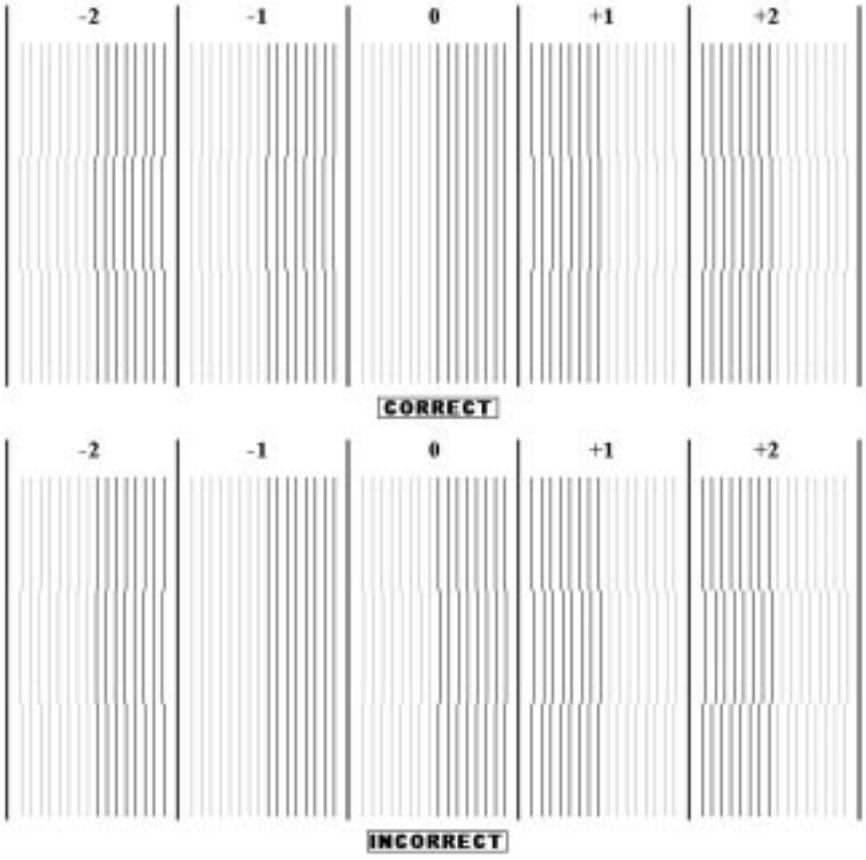


Figure 4

VLS Problem: If the line is not perfectly straight at **Bias 0** in the test image (see Figure 4).

Corrective Action: Try the following steps:

1. Perform the Cartridge Alignment Calibration (Details ➧ Users Guide) using genuine HP media then print the Print-Quality Plot again to see if there has been any improvement.
2. If the problem continues perform the Accuracy Calibration (Details ➧ page 5-2) and print the Print-Quality Plot again to see if there has been any improvement.
3. If the error is still present, replace the failing cartridge and print the Print-Quality Plot again.
4. If the error continues try the following:
   - Replace the Trailing Cable ➧ page 8-8.
   - Replace the Carriage Assembly ➧ page 8-37.
   - Replace the Electronics Module ➧ page 8-13.

   Only replace one component at a time and check if the problem has gone before replacing another component. Using this procedure you will be able to determine exactly which component failed.

Test Pattern 4: *Color Alignment Quality Test*

Upper Test: The first of these patterns tests alignment between the cyan and magenta cartridges; it should be blue with no cyan or magenta shadows. The second tests alignment between the cyan and yellow cartridges; it should be green with no cyan or yellow shadows. The third tests alignment between the magenta and yellow cartridges; it should be red, with no magenta or yellow shadows.

Lower Test: This test pattern is to check the color alignment, and produces 6 patterns each with 2 different primary colors. In each pattern you will see primary color circles. If there is misalignment between the primary colors the composite color will be present in one part of the circle and white will be visible at the opposite side of the circle.

There are two types of misalignment (see Figures 5 and 6):

- Horizontal - when the misalignment is in the horizontal axis.
- Vertical - when the misalignment is in the vertical axis.

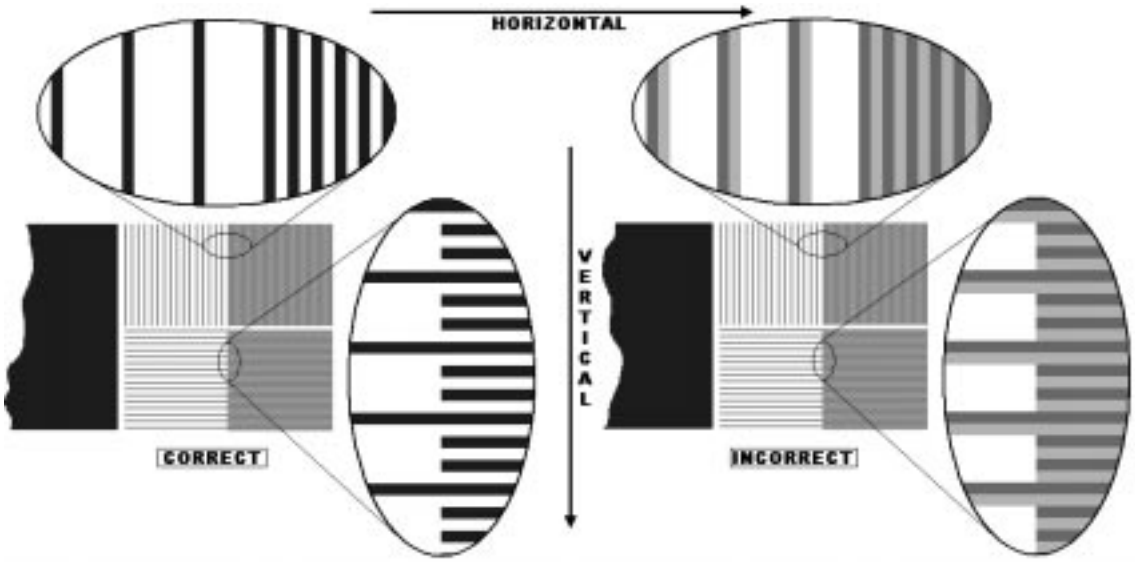


Figure 5

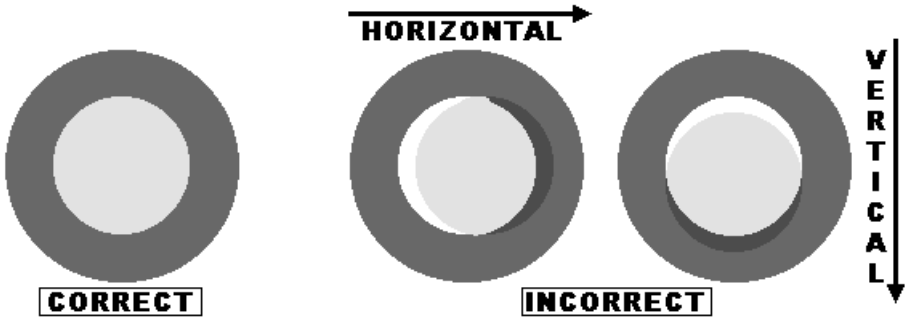


Figure 6

Alignment Problem: Third color present/misalignment in either the boxes or circles of the test image (see Figures 5 & 6).

Corrective Action: Try the following steps:

1. Perform the Cartridge Alignment Calibration (Details ➧ Users Guide) using genuine HP media then print the Print-Quality Plot again to see if there has been any improvement.
2. If the error is still present, replace the failing cartridge and print the Print-Quality Plot again.

3 If the problem continues perform the Accuracy Calibration (Details ➧ page 5-2) and print the Print-Quality Plot again to see if there has been any improvement.

4 If the error continues try the following:

- Replace the Trailing Cable ➧ page 8-8.
- Replace the Carriage Assembly ➧ page 8-37.
- Replace the X-axis Assembly ➧ page 8-23.

Only replace one component at a time and check if the problem has gone before replacing another component. Using this procedure you will be able to determine exactly which component failed.

Test Pattern 5: *Color Variation Test*

This test produces four boxes; black, magenta, cyan and yellow. In each box there are two horizontal bands, the lower band is 100% shade, the upper band is shaded from 100% scaling to 60%.

The purpose of this test is to determine at what percent the upper shading becomes visible from the lower band. The best way to do this is to cover the box with a piece of paper and slide the paper horizontally across the box. Stop as soon as you see a different shade in the upper box. You can then determine the percentage scaling from the figure at the top or bottom of the box.

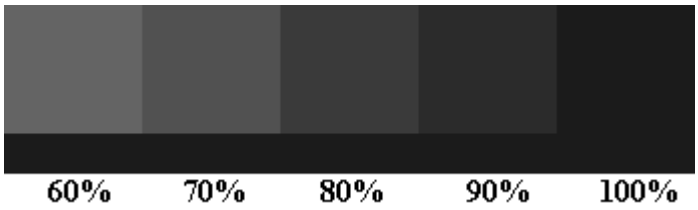


Figure 7 (Correct)

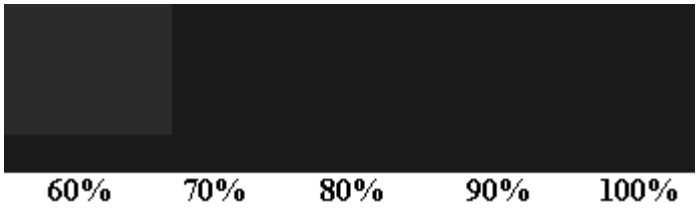


Figure 8 (Incorrect)

Variation Problem: If the upper box shading is **never** visible or is visible at a very low percentage, it is an indication that the cartridge is producing incorrect size ink drops (see Figure 8).

Corrective Action: Try the following steps:

1. Replace the failing cartridge and print the Print-Quality Plot again.
2. If the error continues try the following:
   - Replace the Trailing Cable ➧ page 8-8.
   - Replace the Carriage Assembly ➧ page 8-37.

   Only replace one component at a time and check if the problem has gone before replacing another component. Using this procedure you will be able to determine exactly which component failed.

Test Pattern 6: *Banding Test*

This Test pattern is a long dark stripe and is NOT numbered on the Print-Quality plot. It can be found on the left hand-side of the other test patterns.

Symptoms

Random dark or light bands in area fills. There are two types of banding:

- Negative Banding - This means that consecutive swaths overlap each other, creating dark bands.
- Positive Banding - This means that consecutive swaths do not touch, thus leaving a small gap between each other. This then causes white (or lighter) bands.

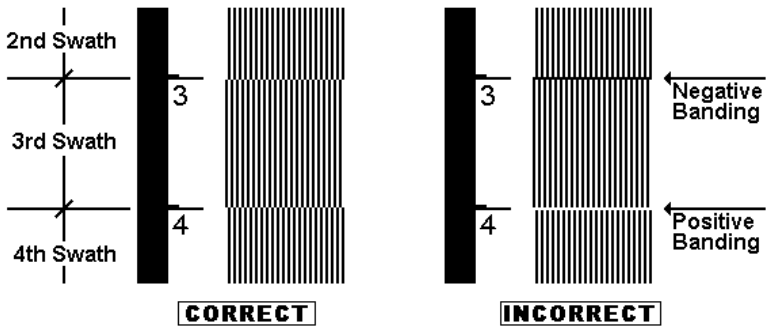


Figure 9

Cartridge Fault

- A nozzle is blocked or faulty and is not firing ink-drops.
- The ink drops of one nozzle are of smaller volume than those of the other nozzles.
- A nozzle's ink drop volume varies while plotting.
- A nozzle's ink drops are misdirected:
  - Defect in manufacture of cartridge.
  - Dirt or debris on the nozzle plate.
  - Ink puddling on the nozzle plate.
- An electrical contact is misaligned or damaged on the cartridge, so that it doesn't make correct contact with the circuit on the carriage. (See ➧ page 4-12, § *Carriage Test*.)

Printer Fault

- Incorrect swath-advance angle of the drive roller. This could be caused by a:
  - Faulty roller (irregular roller radius / defective bearings)
  - Media-axis inaccuracy (defective media motor or driver circuit / calibration lost)
- An electrical contact is faulty in one of the Printer cartridge chutes, so that it doesn't make correct contact with the circuit on the cartridge. (See ➧ page 4-12, § *Carriage Test*.)
- Nozzles touch the service station, thus causing puddling to occur on the print-head.
- Some of the small slots on the encoder strip are damaged. Therefore the Printer cannot position the carriage correctly during cartridge servicing.
- Cartridges are misaligned with respect to each other.
- Calibration values lost or incorrect.

Media Fault

Some types of media have a coating that prevents them getting "wet" from the ink drop. The ink doesn't spread out sufficiently around the point where the dot is placed.

Banding may not occur on some poor-quality media, where it is counteracted by another problem: large dot gain. This is where the ink spreads out excessively on the media around the desired dot position. To accurately test for banding, use HP polyester inkjet film.

Banding Problem: If there is negative or positive banding in the test image (see Figure 9).

Corrective Action: Try the following steps:

1. Perform the Cartridge Alignment Calibration (Details ➧ Users Guide) using genuine HP media then print the Print-Quality Plot again to see if there has been any improvement.
2. If the problem continues perform the Accuracy Calibration (Details ➧ page 5-2) and print the Print-Quality Plot again to see if there has been any improvement.
3. Remove the all Cartridges and clean the flex contacts on the Carriage and the Cartridges. Reseat the Cartridges and try the test again.
4. If the error is still present, replace the cartridges and print the Print-Quality Plot again.
5. If the error continues try the following:
   - Replace the Encoder Strip ➧ page 8-15.
   - Replace the Trailing Cable ➧ page 8-8.
   - Replace the Carriage Assembly ➧ page 8-37.
   - Replace the Electronics Module ➧ page 8-13.

   Only replace one component at a time and check if the problem has gone before replacing another component. Using this procedure you will be able to determine exactly which component failed.

No Printing Defects Found in the Print-Quality Plot

If all the test patterns from the Print-Quality Plot are correct and you still experience print quality problems, here are some of the other causes to check:

- The print mode used in your printer is incorrect (this is defined by the printer's front-panel menu selections).
- Non-HP driver.
- The RIP (If you are using one).
- The software applications you are using.

Refer to the ***User's Guide*** for further information on how to configure the system with correct settings.

Media

Always make sure that the customer is using the appropriate media for the required image and that it is consistent with the software application being used. To ensure color accuracy and print quality performance of the printer, only media types that have been certified for the printer should be used. Use of non-HP media or HP media not certified for the the printer may significantly reduce the color and print quality of the required images. For details of HP media, refer to the ***User's Guide*** or the ***Media Guide***.

To have accurate colors, the media settings must match the type of media loaded in the printer.

If the customer is using non-HP media with HP drivers, the colors in the required print may not be accurate. Advise the customer to use HP media if they want to improve the accuracy of the colors.

STARWHEEL MARKS

On some drawings (for example, CAD drawings having a thick-lined frame around them) on some types of media, you may notice some small marks made by the starwheels. These cannot be avoided.

UNEVEN FILL DENSITY

Symptoms

Blotchy area fills.

Product Fault

- An incorrect media-type setting has been selected on the front panel and does not correspond to the media being used.

Media Fault

The ink is incompatible with the media and does not spread uniformly through the area fill.

Solutions

One or both of the following actions may be appropriate to solve an uneven-fill-density problem:

- Change the media-type setting on the front panel.
- Use a more suitable media type.
- Replace the faulty cartridge(s).
- If the problem is occurring in black area fills on color plots printed in Normal print-quality mode, then use Best print-quality mode instead.

SPRAY

Symptoms

Smaller dots of sprayed ink located around the point at which the required dot is placed.

Product Fault

The cartridges are positioned too far from the media.

Solution

Check the carriage-to-media distance. (Details ➧ chapter 5.)

Replace the faulty cartridge(s).

BLEEDING, BLOOMING AND WICKING

Symptoms

Blurred lines. (See also ➧ User's Guide, chapter 9.)

- **Bleeding:** Different color inks, printed side by side, run into each other.
- **Blooming:** Ink absorbs into the paper, spreading beyond the desired ink dot.
- **Wicking:** Ink spreads along a fiber or fibers in the paper, creating a "spider web" effect.

Product Fault

Printing in fast mode.

Media Fault

- The ink is incompatible with the media type.
- Environmental conditions may affect the media. (Temperature or humidity levels are too high.)

Solutions

One or more of the following actions may be appropriate to solve the problem:

- Change the plot-quality mode: Plotting in **Best** mode slows plotting but improves quality.
- Use better quality media.
- If you are plotting on vellum or translucent media, try using Hewlett-Packard media.
- Recommended environmental conditions for optimum plot quality are in the range of 15 - 35 degrees Celsius (59 - 95 degrees Fahrenheit) with 20 - 80 % relative humidity.
- Pen problem: TTOE (Thermal Turn-On Energy) has not been performed because of incorrect cartridge change. With the power ON, open the top cover and reseat the cartridge.

INK SMEARING

Symptoms

Ink smears on the media. (See also ➧ User's Guide, chapter 9.)

Product Fault

The media touches the print heads. This can occur because:

- The media-holding mechanism is not holding the media correctly, and the media buckles.
- The carriage-to-media distance is too small. (Adjustment ➧ chapter 5.)

HUE CHANGES

Symptoms

Changes of hue are noticed when printing in color.

Cartridge Fault

One or more of the print cartridges is running out of ink. (Typically the inks of the four cartridges are used at different rates.)

Solution

Replace the print cartridge with a new one.

7

Parts and Diagrams

Exchange Assemblies

Exchange assemblies are factory-repaired and tested assemblies that you can order; they are listed in the following table. Exchange assemblies are available only on a trade-in basis; therefore, you must return the defective assemblies for credit.

Exchange Assemblies

HP Part Number	Qty	Description
C4713-60037	1	Electronics Module

Replacement Parts

Parts shown in the drawings in this chapter are listed in the corresponding part lists. Match the appropriate number on the drawing with the same number in the parts list for information on that part. The total quantity for each part on the drawing is given as well as the part number.

To obtain replacement parts, contact the nearest HP Support Office. You must include the part number and part description in the order you send. Also include the Printer model and serial number.

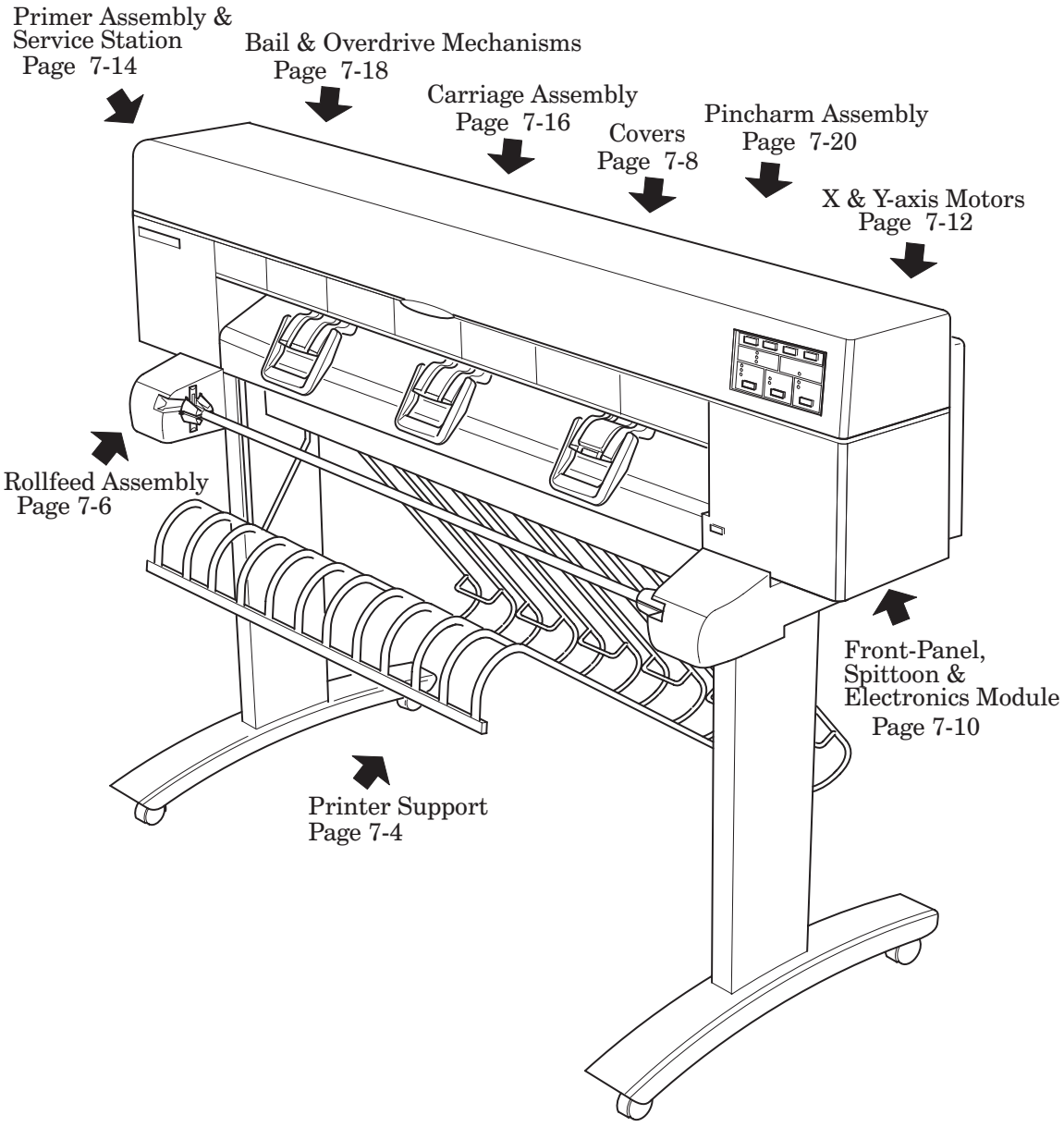


Figure 1 - General View

Figure 2 - Printer Support

Reference on Drawing	HP Part Number	Quantity	Description
1	C4704-60095	1	Hardware Kit (Includes Screw Drivers)
2	C4704-60086	2	Foot Assembly
3	C4704-60075	2	Legs Assembly
4	C6069-60002	1	X-axis Brace (D/A1-size)
	C4704-60077	1	X-axis Brace (E/A0-size)
5	C6069-40001	1	End Cap (D/A1-size)
	C4704-40070	1	End Cap (E/A0-size)
6	C6069-60001	1	X Bar Assembly (D/A1-size)
	C4704-60074	1	X Bar Assembly (E/A0-size)
7	C4704-60073	6	Paper Loop Assembly

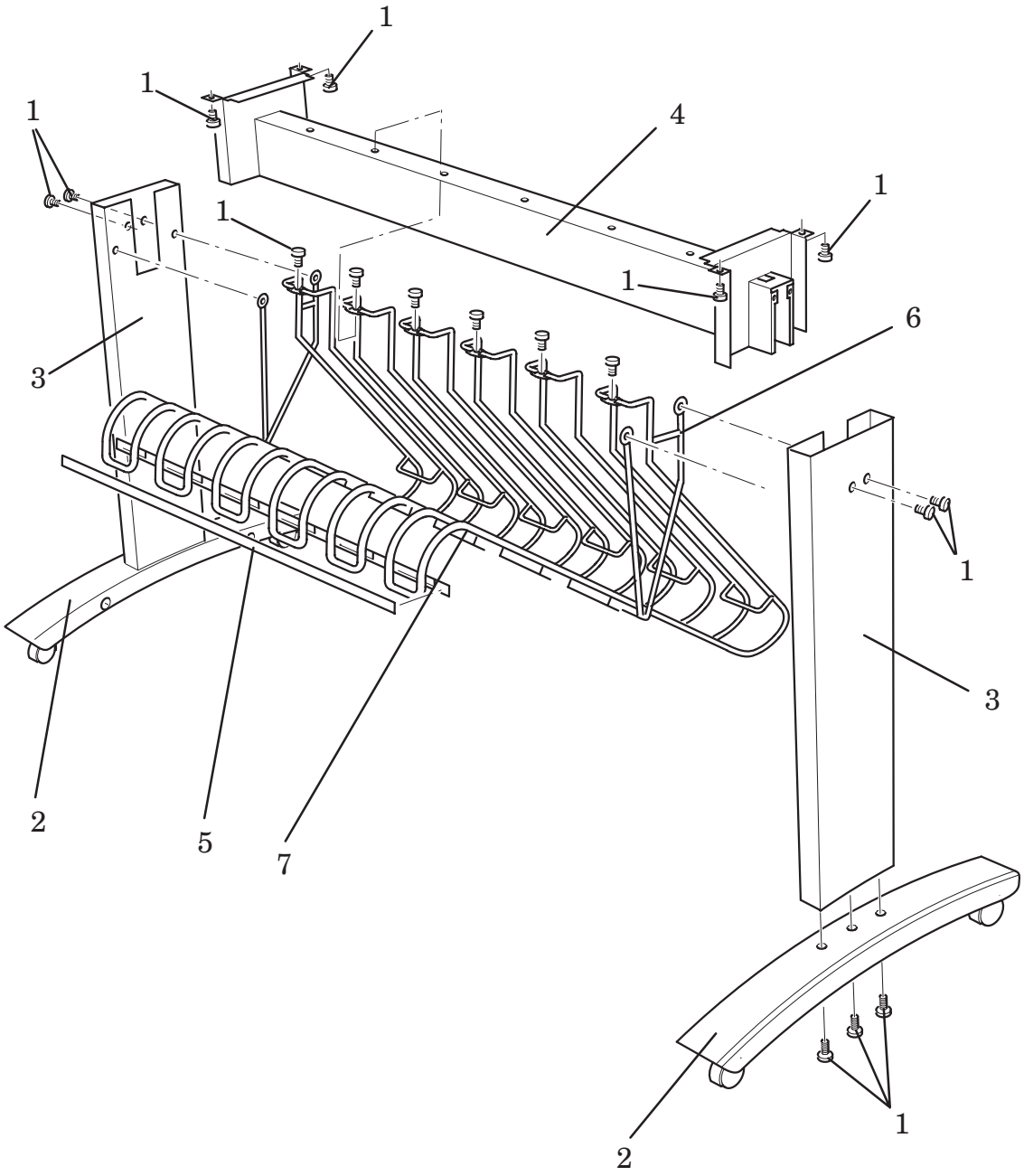


Figure 2 - Printer Support

Figure 3 - Rollfeed Assembly

Reference on Drawing	HP Part Number	Quantity	Description
1	C4717-60004	1	Rollfeed Hardware Kit
2	C4717A	1	Rollfeed Assembly (D/A1-size) (Includes Spindle, Hardware kit and Hubs)
	C4719A	1	Rollfeed Assembly (E/A0-size) (Includes Spindle, Hardware kit and Hubs)
3	C4717-60003	1	Spindle (D/A1-size)
	C4719-60003	1	Spindle (E/A0-size)
4	C4717-40017	2	Spindle Hub
	C4713-60120	1	Spindle Hub Kit (for Chinese Spindles only)
5	C4713-60038	1	Extensions Kit Assembly

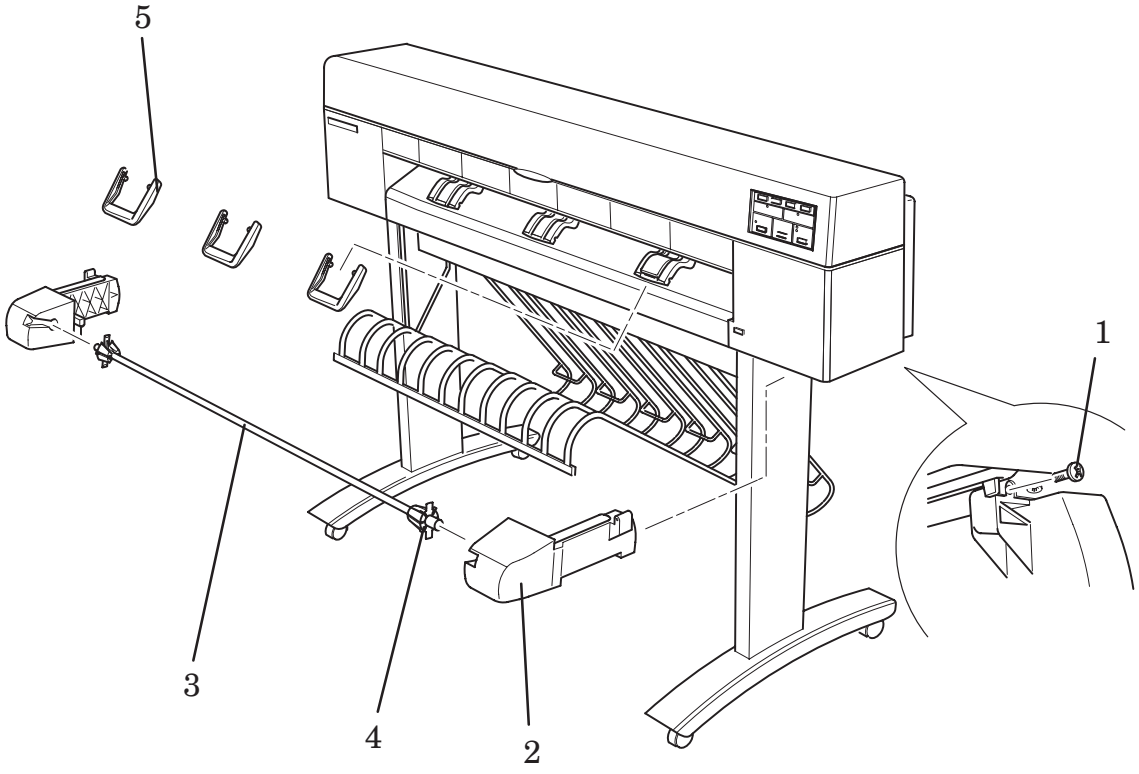


Figure 3 - Rollfeed Assembly

Figure 4 - Covers

Reference on Drawing	HP Part Number	Quantity	Description
1	C4713-60014	1	Top Cover (D/A1-size)
	C4714-60014	1	Top Cover (E/A0-size)
2	C4713-40029	1	Left End Cover
3	C4713-40046	1	Switch Button
4	C4713-60030	1	Right End Cover
5	C4713-60097	1	Back Cover (D/A1-size)
	C4714-60097	1	Back Cover (E/A0-size)
6	0515-2246	2	Screw Torx M3
7	C4699-60072	1	Cable Cip Assembly
8	C4713-00011	1	SIMM Cover Plate
9	See Page 7-26	1	RAM SIMM
10	C4713-60125	1	ROM SIMM (Version A.01.03)

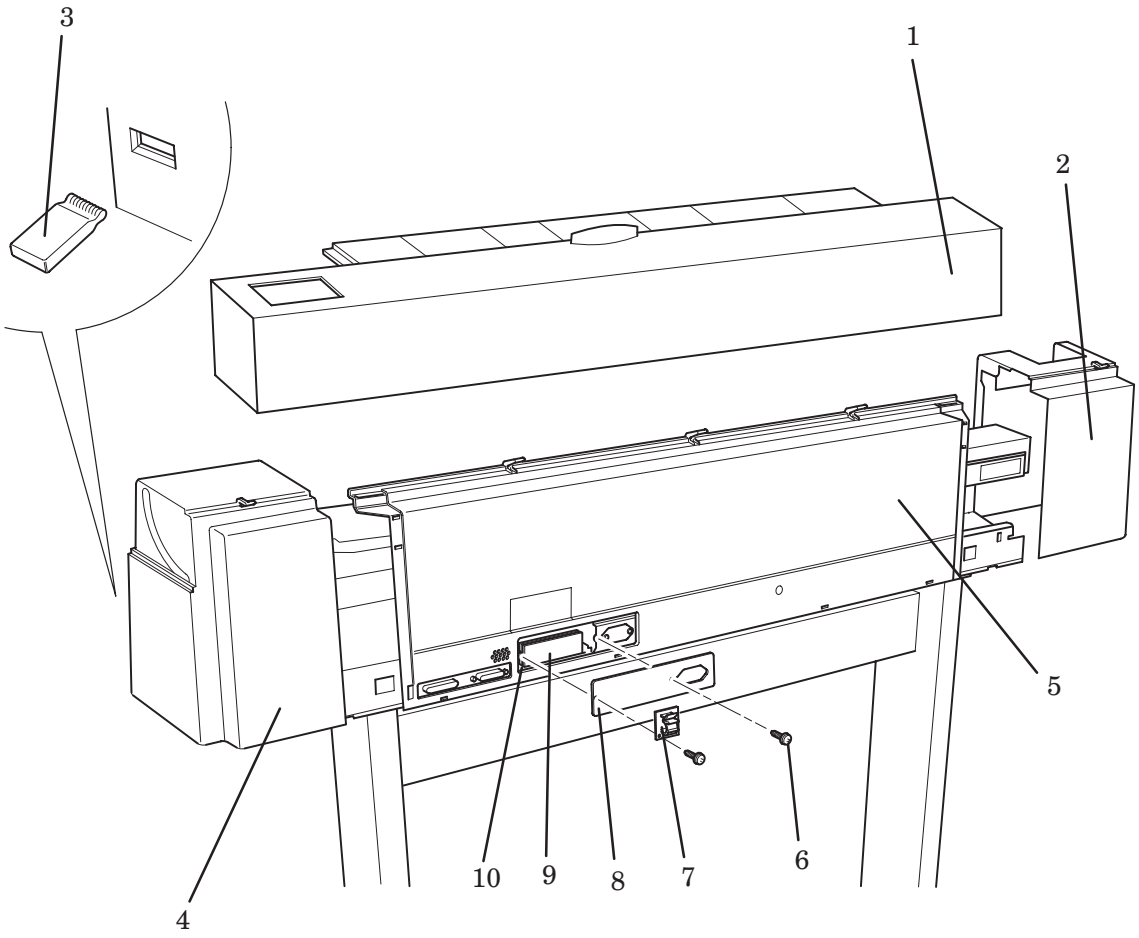


Figure 4 - Covers

Figure 5 - Front Panel, Spittoon and Electronics Module

Reference on Drawing	HP Part Number	Quantity	Description
1	C4713-60091	1	Front-Panel Assembly
2	0515-1743	1	Screw
3	-	1	Washer (Included with Item 2)
4	C4713-60017	1	Spittoon Assembly
5	0515-2282	2	Screw
6	-	2	Washer (Included with Item 5)
7	C4713-60037	1	Electronics Module

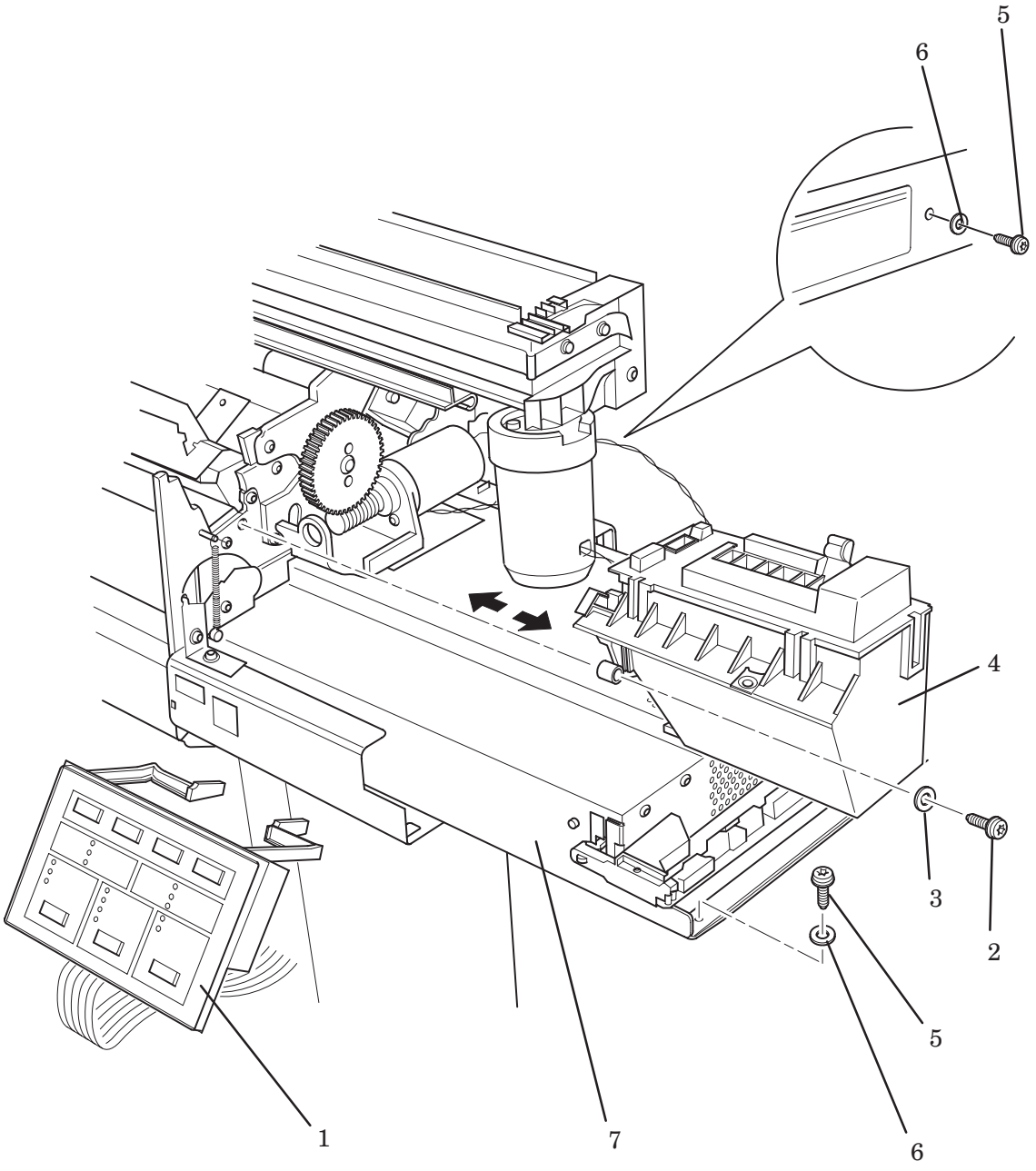


Figure 5 - Front Panel, Spittoon and Electronics Module

Figure 6 - X and Y axis Motors and Encoder Strip

Reference on Drawing	HP Part Number	Quantity	Description
1	0535-0031	2	Nut
	3050-1267	2	Washer
2	C4713-60098	1	Encoder Strip (D/A1-size)
	C4714-60098	1	Encoder Strip (E/A0-size)
3	C4699-00016	1	Encoder Spring
4	0515-2765	1	Screw M4.2 x 35 Pan Torx stl
5	C4713-40017	1	Right Bracket
6	C3190-00013	1	Right Strap (clip)
7	C4713-60092	1	Carriage-Motor Assembly
8	0515-1349	2	Screw M3 x 30 Mach T10
9	0515-2248	3	Screw
10	-	3	Washer (Included with Item 9)
11	C4713-60094	1	Media-Motor Assembly (Includes Helical Gear)
12	C3180-60012	1	Media-Motor Cable
-	6040-0858	AR	Lubricant
-	C3190-60155	AR	Lubricant Grease

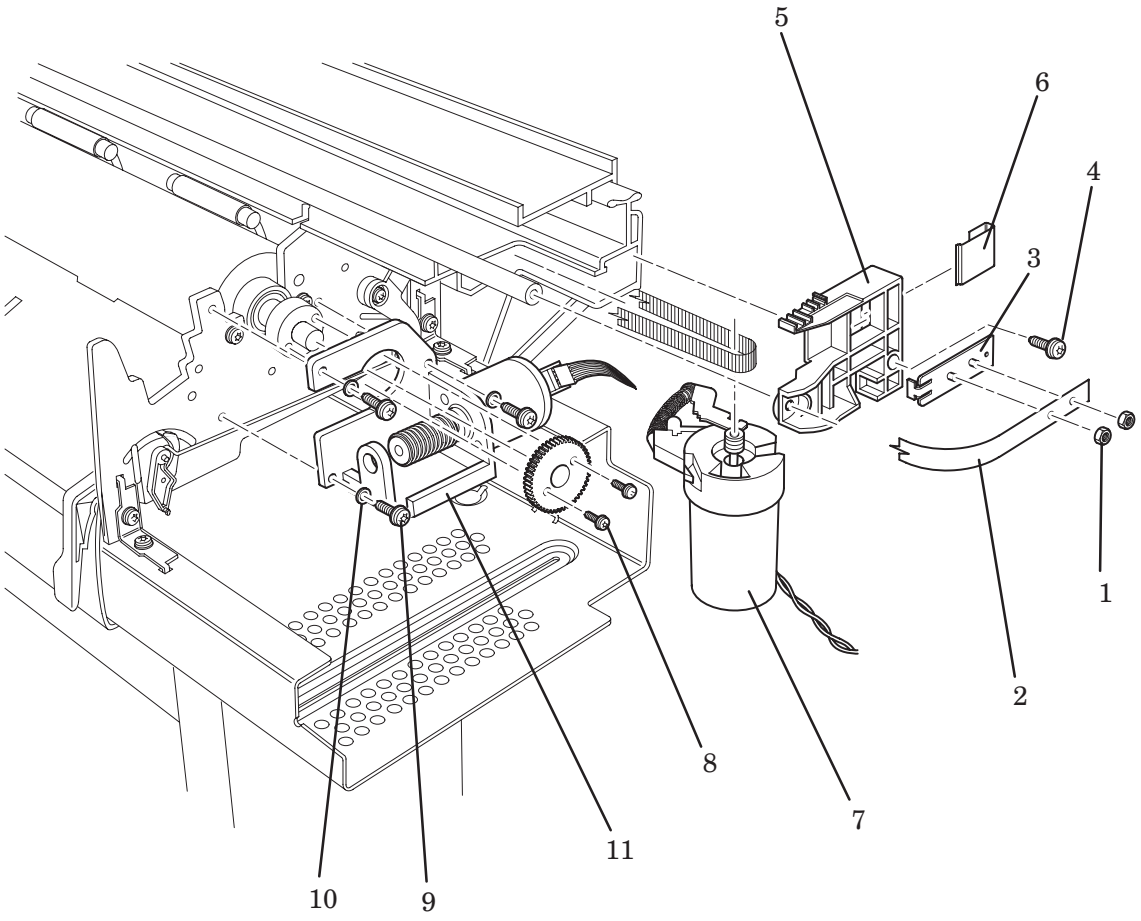


Fig 6 - X and Y axis Motors and Encoder Strip

Figure 7 - Primer Assembly and Service Station Assembly

Reference on Drawing	HP Part Number	Quantity	Description
1	0515-1743	2	Screw M4 x 17 Tap 20
2	C3190-60142	1	Service Station Assembly
3	C4713-60023	1	Primer Assembly
4	0624-0704	1	Screw 6-19 .375 Plas T15
5	3050-1267	1	Washer
6	C4713-60098	1	Encoder Strip (D/A1-size)
	C4714-60098	1	Encoder Strip (E/A0-size)
7	0515-2765	1	Screw M4.2 x 35 Pan Torx stl
8	C3190-40040	1	Left Bracket
9	C3190-00012	1	Left Strap (clip)
-	C4713-40042	1	Primer Cover (DesignJet 430)

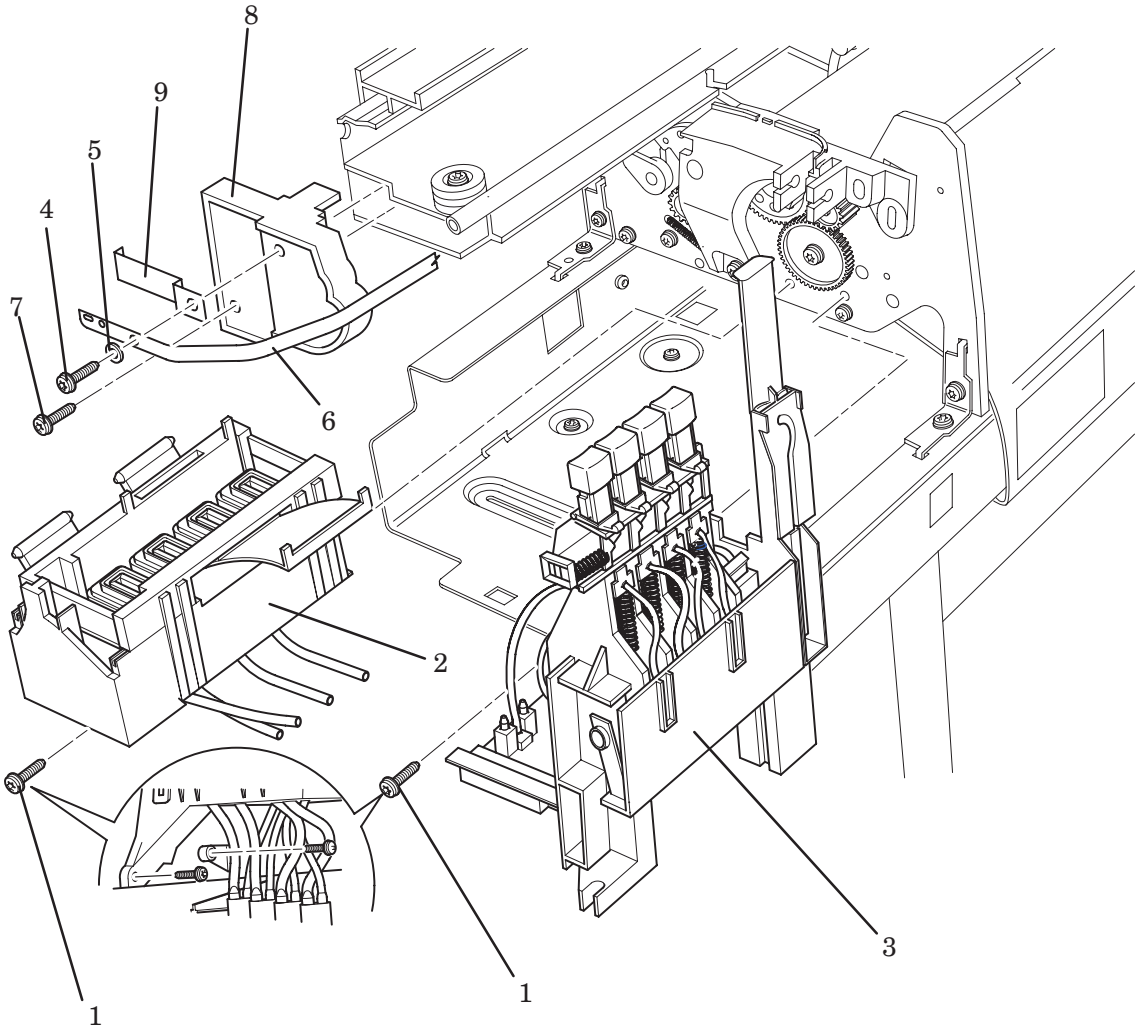


Figure 7 - Primer Assembly and Service Station Assembly

Figure 8 - Carriage Assembly and Trailing Cable

Reference on Drawing	HP Part Number	Quantity	Description
1	C4713-40038	1	Carriage Top
2	C3190-00086	1	Trailing-Cable Metal Clip
3	C3190-60038	1	Trailing Cable Assembly (D/A1-size)
	C3191-60038	1	Trailing Cable Assembly (E/A0-size)
4	C4713-60039	1	Carriage Assembly
5	C4705-60082	1	Carriage Belt (D/A1-size)
	C4706-60082	1	Carriage Belt (E/A0-size)
6	C4699-60052	1	Trailing Cable Guide (D/A1-size)
	C4700-60052	1	Trailing Cable Guide (E/A0-size)
7	1400-1021	4	Trailing Cable Plastic Clip
8	C4713-60040	1	Cutter Assembly
-	C4701-40001	1	Cartridge Cover (DesignJet 430)

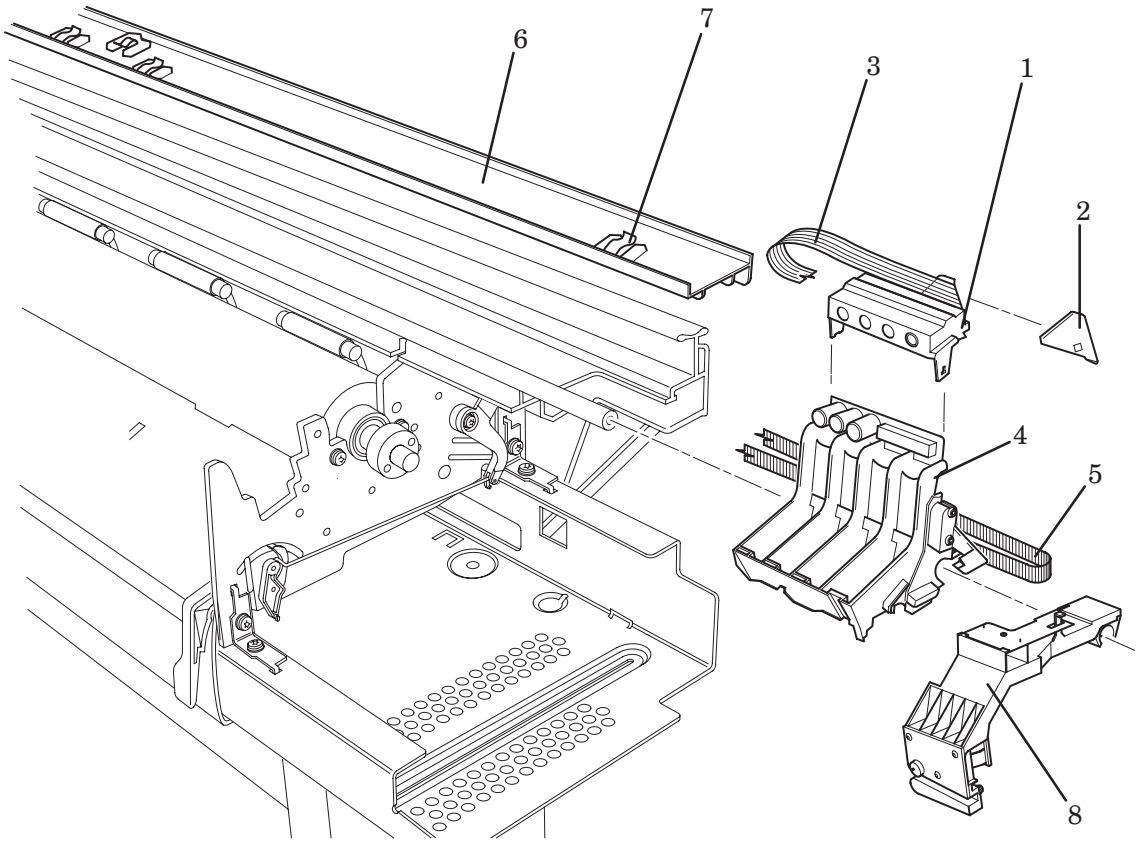


Figure 8 - Carriage Assembly and Trailing Cable

Figure 9 - Bail and Overdrive Mechanisms

Reference on Drawing	HP Part Number	Quantity	Description
1	C3190-60132	1	Pulley Assembly
2	C3190-40022	1	Engaging Lever
3	0515-1743	2	Screw M4 x 10 Tap T20
4	-	2	Washer (Included with Item 3)
5	0515-2200	1	Screw M3 x 8 Tap T10
6	-	1	Washer (Included with Item 5)
7	07575-80012	1	Gear-Support Spring
8	C4713-40016	1	Engaging-Lever Support
9	0624-0617	1	Screw 6-9 .937 Plast T15
10	C3190-40019	1	Cam Gear
11	0624-0745	1	Screw
12	3050-0026	1	Washer
13	C1633-40027	1	Engaging Gear
14	C3190-40020	1	Bail-Lift Cam
15	C3190-60007	1	Bail Cable
16	C3190-80013	1	Cable Spring
17	C3190-40021	1	Gear Support
18	C2847-20017	1	Shoulder Screw
19	C1633-40019	1	Overdrive Gear
20	0515-0083	1	Ring Net .250 OD
21	C3190-60131	1	Clutch Assembly
22	C4713-40030	1	Sideplate Bushing

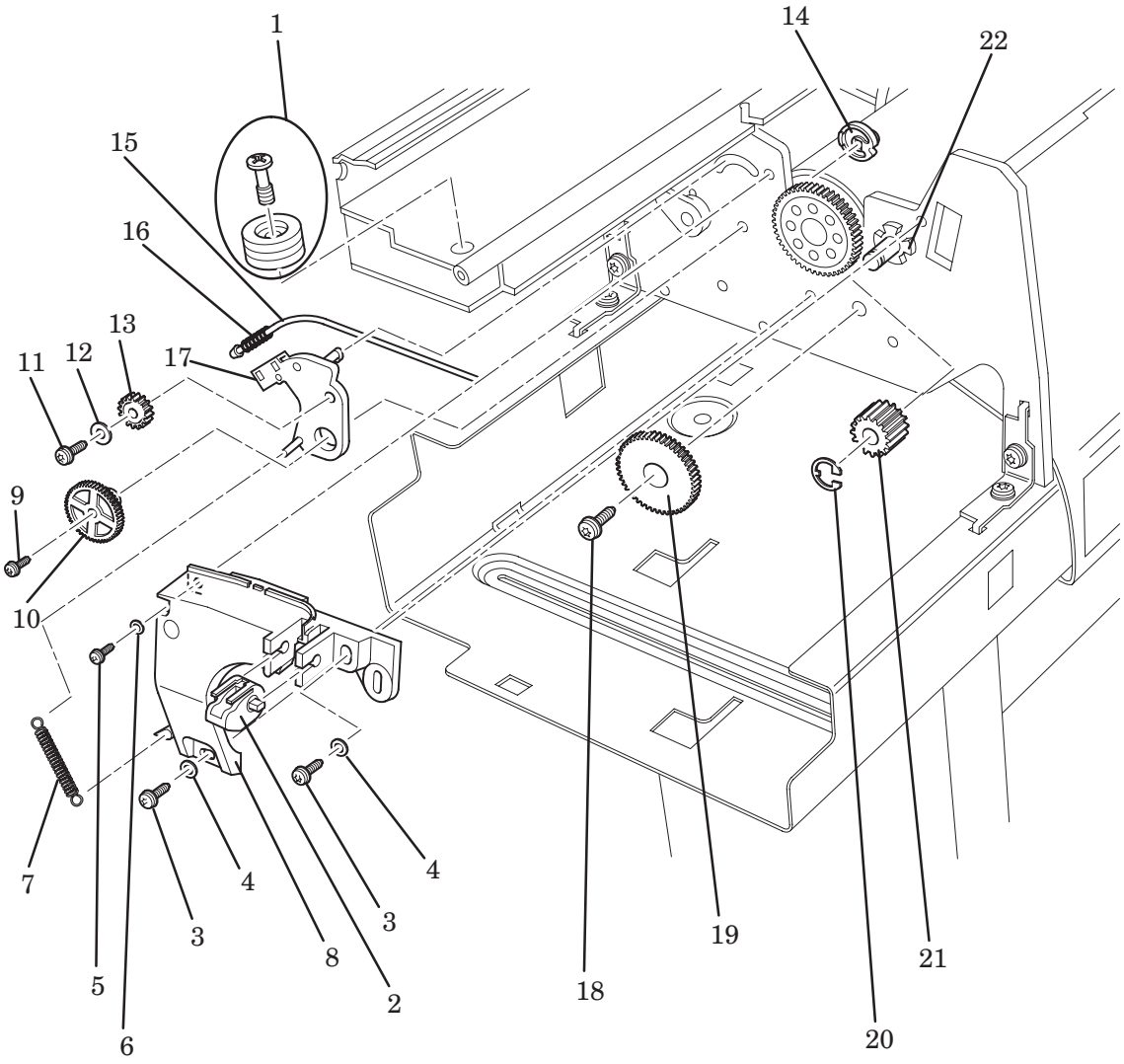


Figure 9 - Bail and Overdrive Mechanisms

Figure 10 - Pincharm Assembly

Reference on Drawing	HP Part Number	Quantity	Description
1	0624-0771	1	Screw M3 x 30 Mach T10
2	C4713-40025	1	Pincharm Lever
3	0515-2282	1	Screw
4	-	1	Washer (Included with Item 3)
5	C4713-60034	1	Pincharm Sensor Assembly
6	C4713-80003	1	Pincharm Mechanical Spring
7	C4713-60116	1	Right Cam Journal Assembly
8	C3190-60149	1	Left Cam Journal Assembly
9	C2847-20005	1	Pincharm Bar Cam (D/A1-size)
	C1633-20012	1	Pincharm Bar Cam (E/A0-size)
10	C1633-40082	5	Pincharm Bar Bushing (D/A1-size)
	C1633-40082	7	Pincharm Bar Bushing (E/A0-size)
11	C1633-80005	5	Pincharm Bar Spring (D/A1-size)
	C1633-80005	7	Pincharm Bar Spring (E/A0-size)
12	C4699-60081	5	Pincharm Assembly (D/A1-size)
	C4699-60081	7	Pincharm Assembly (E/A0-size)

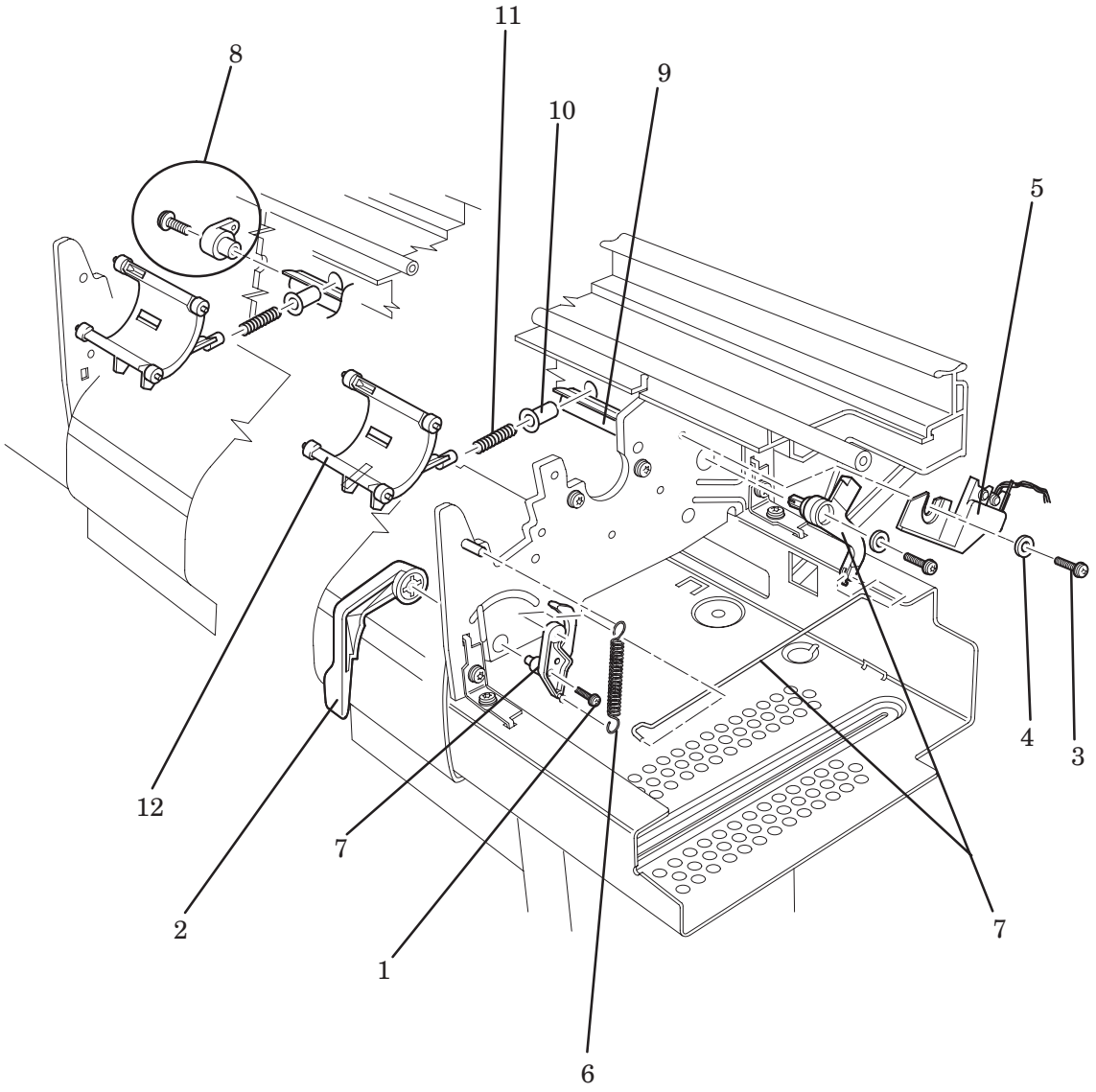


Figure 10 - Pincharm Assembly

Figure 11 - Entry Platen, Drive Roller, Bail and Overdrive Assembly

Reference on Drawing	HP Part Number	Quantity	Description
1	C4713-60093	1	Bail Assembly (D/A1-size)
	C4714-60093	1	Bail Assembly (E/A0-size)
2	0515−2337	1	Screw Long Dogpoint
3	0515−2765	1	Screw
4	C3180-20001	2	Alignment Screw
5	C4713-60115	1	Overdrive Assembly (D/A1-size)
	C4714-60115	1	Overdrive Assembly (E/A0-size)
6	0515-2250	2	Screw (Media Button Assy)
7	C4713-60117	1	Media Button Assembly
8	0515-2250	1	Screw (Media Deflector)
9	C4713-40011	1	Media Deflector
10	C4699-60042	1	Driver Roller Assy (D/A1-size)
	C4700-60042	1	Driver Roller Assy (E/A0-size)
11	C4713-40023	1	Side Trim Left
12	0627-0769	1	Screw
13	C4713-40022	1	Side Trim Right
14	C3180-20001	1	Alignment Screw
15	C4713-60114	1	Entry Platen Assy (D/A1-size)
	C4714-60114	1	Entry Platen Assy (E/A0-size)
16	0515-1743	1	Screw

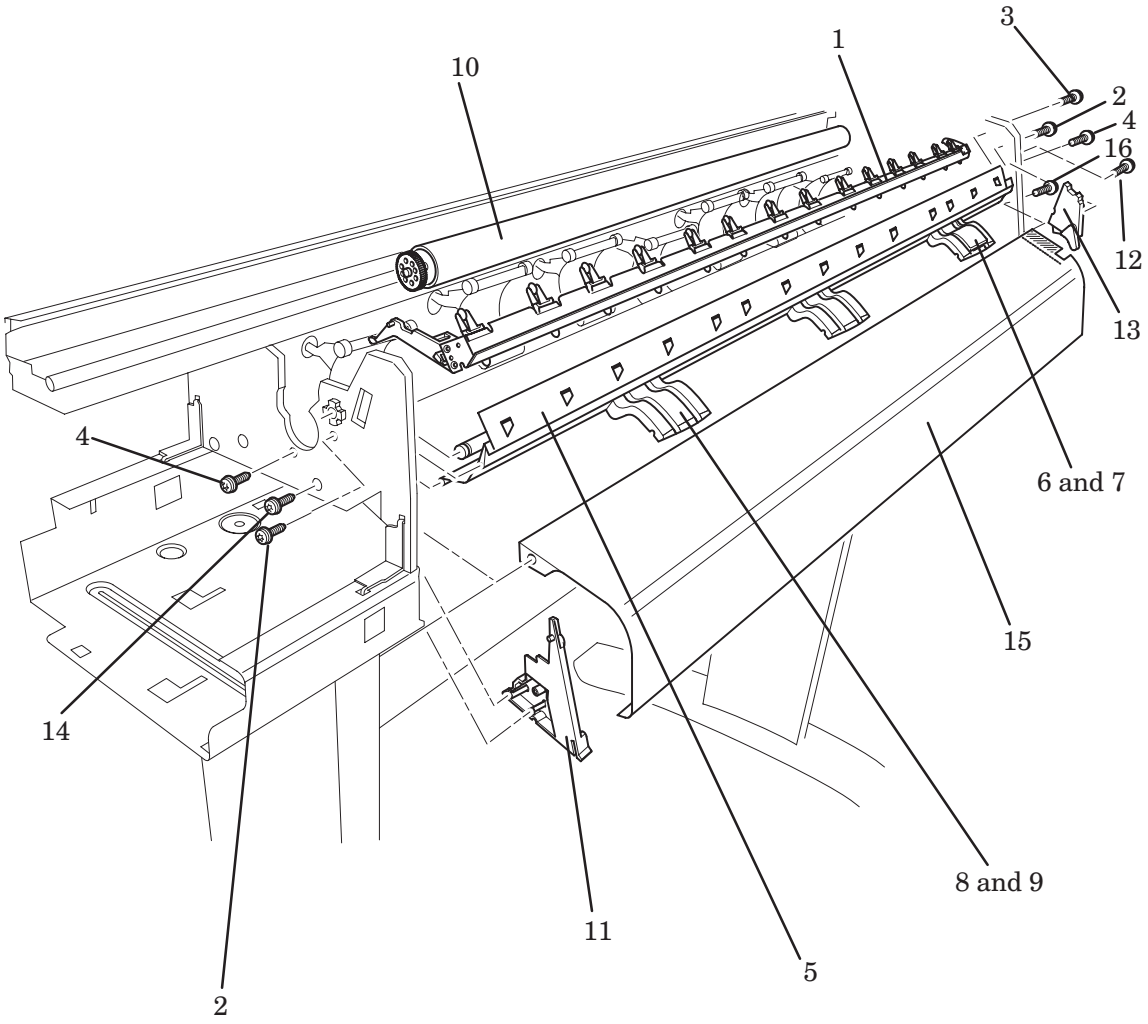


Figure 11 - Entry Platen, Drive Roller, Bail and Overdrive Assembly

Printer Labels

Reference on Drawing	HP Part Number	Quantity	Description
1	5961-3524	1	Serial Label (Right End Cover)
2	C3178-00030	1	Carriage Label (DesignJets 450C and 450CA)
	C4701-00009	1	Carriage Label (DesignJets 430)
3	C3190-40052	1	Quick Reference Guide Holder
4	C4713-00013	1	Nameplate (DesignJets 430)
	C4715-00013	1	Nameplate (DesignJets 450C)
	C6080-00001	1	Nameplate (DesignJets 455CA)
5	C4705-00017	1	Cartridge Insertion Label (Left End Cover)

Users Guide and Quick Reference Guide Bundle

HP Part Number	Description
C4713-60041	English Manual Bundle
C4713-60042	Korean Manual Bundle
C4713-60043	Taiwanese Manual Bundle
C4713-60044	German Manual Bundle
C4713-60045	French Manual Bundle
C4713-60046	Spanish Manual Bundle
C4713-60047	Italian Manual Bundle
C4713-60048	Japanese Manual Bundle
C4713-60049	Portuguese Manual Bundle
C4713-60050	Chinese Manual Bundle

Front Panel Overlays

HP Part Number	Description
C4715-60041	English Front Panel Overlay
C4715-60042	Korean Front Panel Overlay
C4715-60043	Taiwanese Front Panel Overlay
C4715-60044	German Front Panel Overlay
C4715-60045	French Front Panel Overlay
C4715-60046	Spanish Front Panel Overlay
C4715-60047	Italian Front Panel Overlay
C4715-60048	Japanese Front Panel Overlay
C4715-60049	Portuguese Front Panel Overlay
C4715-60050	Chinese Front Panel Overlay

Compatible Documentation

HP Part Number	Description
C4713-90009	Software Application Notes
5965-9424	Accessories Guide
5965-9477	Media Swatch Book
5959-9733	HP-GL/2 and RTL Programmer's Reference Guide (English)
5959-9734	The product Comparison Guide for HP-GL/2 and HP RTL Peripherals (English)
5010-3997	PJL Technical Reference Manual (English)

Plug-in memory (RAM SIMM)

HP Part Number	Description
C3132A	4MB RAM SIMM
C3133A	8MB RAM SIMM
C3146A	16MB RAM SIMM
D3578A	32MB RAM SIMM

Note: For the location of the plug-in memory see page 7-8.

Cartridges

HP Part Number	Description
51640A	Black
51644C	Cyan
51644M	Magenta
51644Y	Yellow

External Print Servers

HP Part Number	Description
J2591A	Jetdirect EX Plus Ethernet
J2593A	Jetdirect EX Plus 3 Ethernet
J2594A	Jetdirect EX Plus 3 Token Ring

Parallel (Bi-Tronics/Centronics) Interface Cables

Computer	HP Part Number	Cable length	Connector type at computer end of cable
HP 9000 workstations, series 300, 400, 700.	C2950A	2.0 m (6.9 ft)	25-pin male
IBM AT, IBM PS/2, IBM PC/XT and compatible computers.	C2951A	3.0 m (9.8 ft)	25-pin male

Serial (RS-232-C) Interface Cables

Computer	HP Part Number	Cable length	Connector type at computer end of cable
HP Vectra or HP 24541A/B serial interface card (9-pin connector). HP 9000 workstations using 9-pin connectors. IBM AT and compatible computers using 9-pin serial connectors.	24542G	3.0 m (9.8 ft)	9-pin female
HP Vectra PC with HP 24541A/B dual serial interface card using the 25-pin connector. HP Apollo workstation using an SPE (Serial/Parallel Expansion) option and supplied adapter cable. DEC VAX. Sun workstation.	17255M	1.2 m (3.9 ft)	25-pin male
IBM PC, PC/XT, IBM PS/2 and compatible computers	C2913A	1.2 m (3.9 ft)	25-pin female
DEC VAX using DEC BC22D, BC03M, or equivalent	17355M	3.0 m (9.8 ft)	
Apple Macintosh Plus, SE, II Series, Classic, LC family, Quadra family, PowerBook, PowerMac	17302A	1.5 m (4.9 ft)	8-pin male mini-DIN
Apple Macintosh 128K and 512K	92219M	1.5 m (4.9 ft)	9-pin male
Extension cable	31391A	5 m (16.4 ft)	25-pin female

8

Removal and Installation

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Introduction

This chapter is a step by step guide to the removal and installation of the key components in the printer. You may find it useful to tick off the steps as they are performed. Use the illustration at the end of each procedure to identify the parts referred to in the text.

The procedures appear in order of removal. So the whole machine can be stripped down by starting at the beginning of this chapter and working through the subsequent procedures.

Before using this chapter to remove and install a new component, always make sure that you have performed the relevant service test from Chapter 4. If the test passes you will not need to replace the component.

Reassembly

Most of the procedures in this chapter describe how to **remove** parts from the Printer. Unless otherwise specified, **reinstall** the parts in the reverse order of removing them.

Safety Precautions

(Safety symbols ➧ Immediately after the table of contents.)

Review WARNING and CAUTION symbols and instructions before you service the Printers. Follow these warnings and cautions for your protection and to avoid damaging the Printer.

WARNING

Serious shock hazard leading to death or injury may result if you do not take the following precautions:

Ensure that the ac power outlet (mains) has a protective earth (ground) terminal.

Switch the Printer off, and disconnect it from the power source prior to performing any maintenance.

Prevent water or other liquids from running onto electrical components or circuits, or through openings in the module.

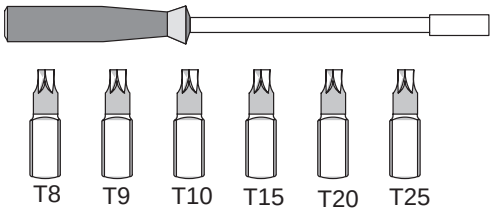
Electrostatic Discharge (ESD) Precautions

To prevent damage to the Printer circuits from high-voltage electrostatic discharge (ESD):

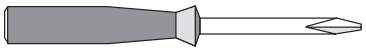
1. Do not wear clothing that is subject to static build-up.
2. Do not handle integrated circuits (ICs) in carpeted areas.
3. Do not remove an IC or a printed circuit assembly (PCA) from its conductive foam pad or conductive packaging until you are ready to install it.
4. Ground (earth) your body while disassembling and working on the Printer.
5. After removing a cover from the Printer, attach an earthing (ground) lead between the PCA common and earth ground. Touch all tools to earth ground to remove static charges before using them on the Printer.
6. After removing any PCA from the Printer, place it on a conductive foam pad or into its conductive packaging to prevent ESD damage to any ICs on the PCA.

Required Tools

The following tools are required to remove and install the printer.

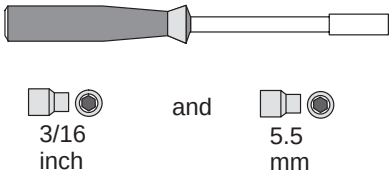


Long Torx screwdriver with the indicated attachments.



Pozidrive PZ1 screwdriver.

Small flat-blade screwdriver.

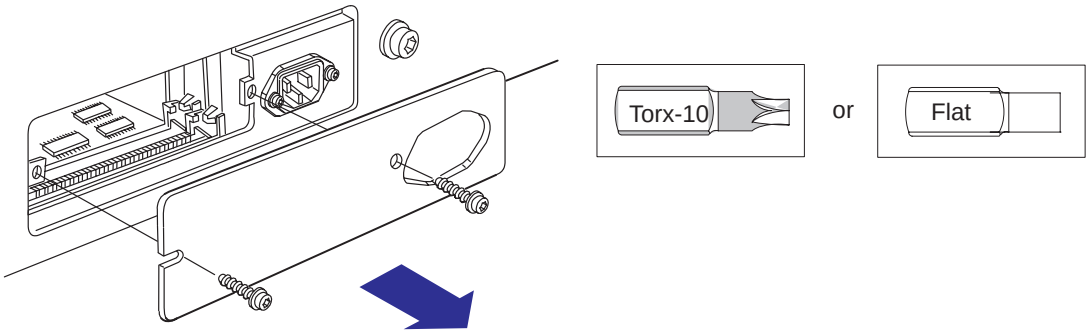


Nut driver with the indicated attachments.

Installing a RAM or ROM SIMM

A RAM SIMM provides the Printer with extra memory. A ROM SIMM contains new firmware code to override the internal firmware code.

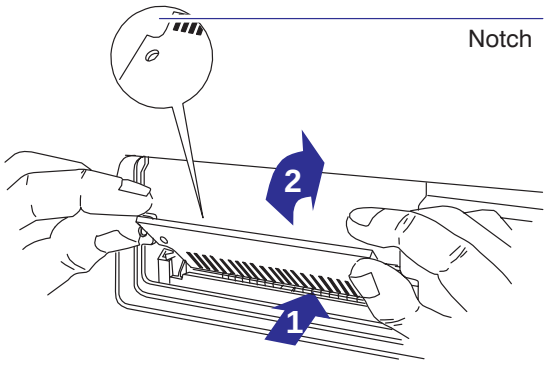
1. Make sure that the Printer is switched OFF and that neither the power cord nor an interface cable is connected.
2. Unscrew the cover plate and the cable clip at the back of the Printer, and remove it.



Before handling a SIMM, either put on a grounding wrist strap and attach the end to the metal chassis of the Printer, or touch the outer metal surface of the Printer with your hand. Otherwise, static electricity from your body could damage the SIMM.

3. Take the SIMM out of its bag, holding the SIMM only by the edges.
4. With the SIMM's small notch on the left and the metallic edge away from you, load the SIMM into the slot:
   - nearest to you (RAM SIMM).
   - furthest from you (ROM SIMM).

   To do this, first hold the SIMM at an angle, and then gradually push it back until it clicks vertically into place.



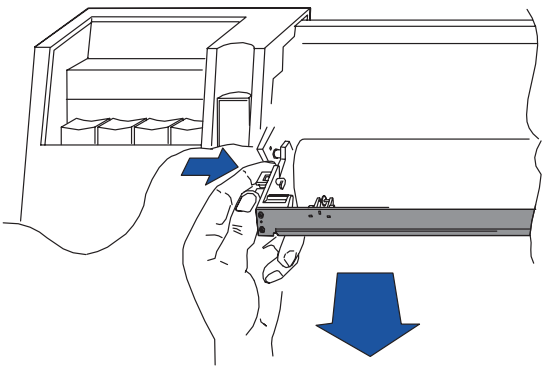
5. Replace the cover plate, the cable clip (held by the left screw) and the screws.

Removing the Bail Assembly

Removal

1. Open the Top Cover.
2. Manually move the carriage assembly to the left side of the Printer.
3. Push one of the plastic ends of the bail assembly towards the center of the Printer to release it from the hole in the sideplate, and lift the bail out of the Printer.

   If the Mark Encoder (the white plastic part installed on the left hand side of the Drive Roller) prevents you from removing the Bail Assembly, use the Media-Axis Test (details ➧ page 4-16) to turn the Drive Roller to a position where the Bail Assembly can be removed easily.



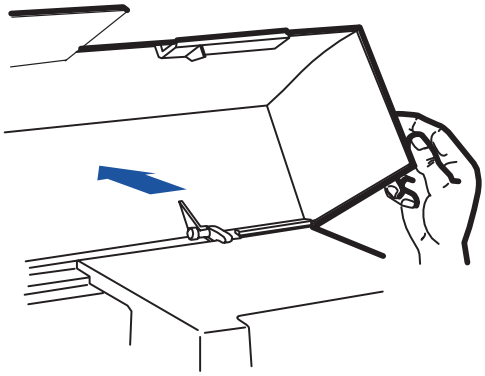
4. Remove the star wheel assemblies (item 2) by pushing together the retaining clips and pulling them off

Installation

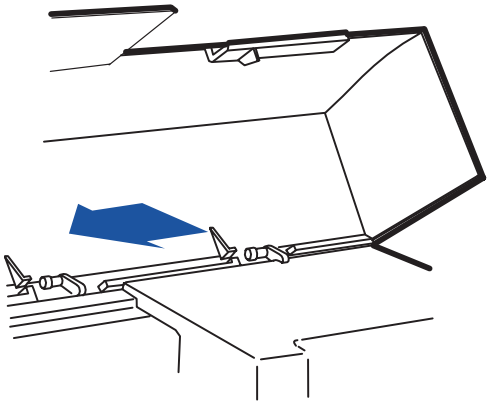
1. Install the bail assembly by installing the left side first, then install the bail assembly into holes in the left and right hand side chassis.
2. Close the Top Cover.
3. Perform Bail Service Test ➧ page 4-23.

Removing the Top Cover

1. Open the top cover.
2. Push the right-hand side of the cover slightly back, so that the rightmost hinge uncouples.



3. Slide the cover to the left, so that the other hinges uncouple.



Reassembling: *Close the cover and click each hinge into place.*

4. Remove the cover from the Printer.

Removing the Rollfeed Assembly

Refer to figure 1.

Removal

1. Remove one screw (Item 1) from the rear that attaches the Right Rollfeed Assembly (Item 2) to the Printer.
2. Slide the Right Rollfeed Assembly (Item 2) forward and remove it from the Printer.
3. Remove one screw (Item 1) from the rear that attaches the Left Rollfeed Assembly (Item 3) to the Printer.
4. Slide the Left Rollfeed Assembly (Item 3) forward and remove it from the Printer.

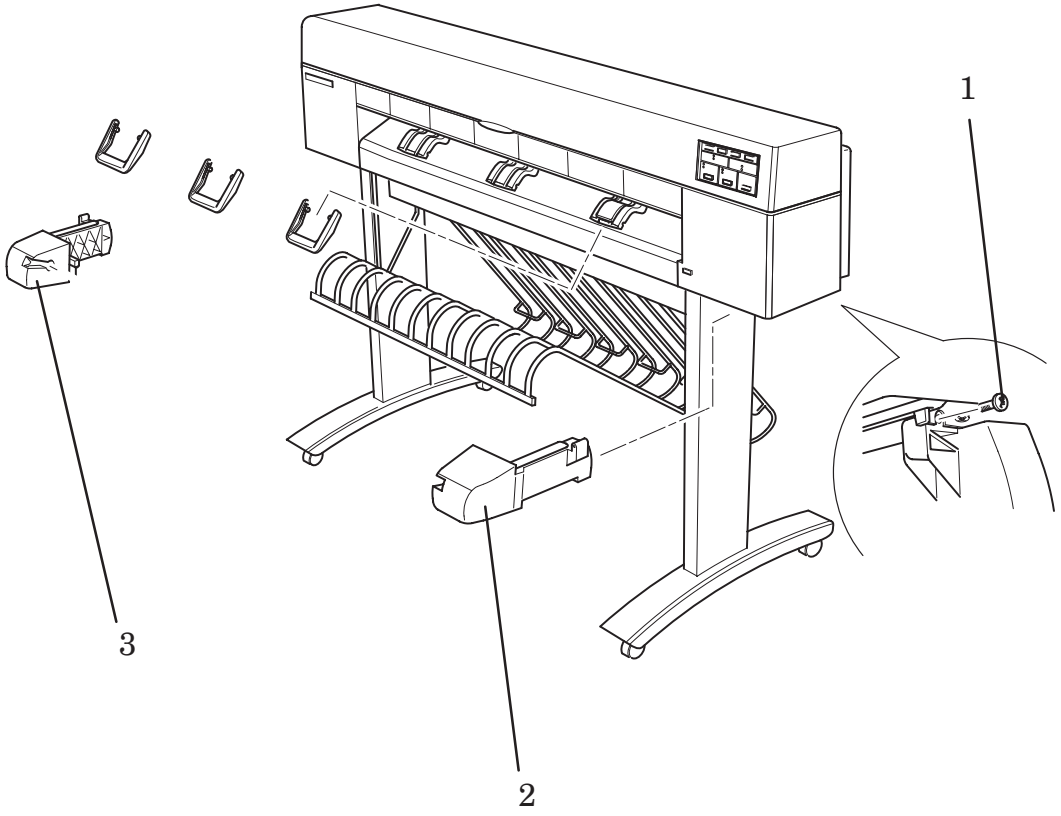


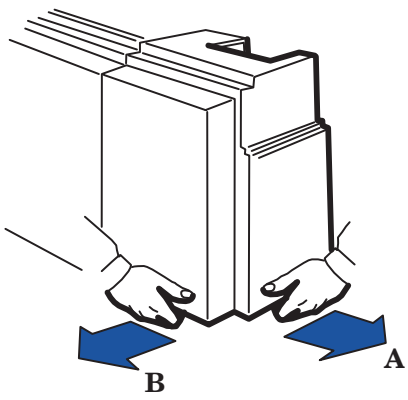
Figure 1: Rollfeed Assembly

Removing the Left End-Cover

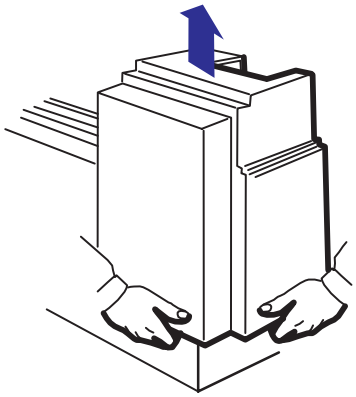
Removal

1. Remove the top cover ➧ page 8-8.
2. Remove the Left Rollfeed Assembly ➧ page 8-9.
3. Release the three clips at the bottom of the end-cover: first the side clip, then the front and back clips.

   These may be stiff.



4. Pull the end-cover up, and remove it from the Printer.



Reassembling: *It's not easy to reinstall the end-covers on the Printer. With some practice, you should learn the knack. As a guide, before you replace an end-cover, take a look at the various clips on its inside, and identify where they fit on the Printer.*

Make sure that the primer plunger is installed properly when reinstalling the end-cover.

Removing the Right End-Cover

Refer to figure 2.

Removal

1. Remove the top cover ➧ page 8-8.
2. Remove the Right Rollfeed Assembly ➧ page 8-9.
3. Pull the Printer on/off switch (item 1) out of the right end-cover (item 2).
4. Release the three clips at the bottom of the right end-cover: first the side clip, then the front and back clips.

   These may be stiff.
5. Pull the end-cover up, taking care not to damage the front-panel cables.
6. Inside the end-cover, press the two tabs of the front-panel towards each other, and remove the front-panel assembly from the end-cover.
7. To be able to easily use the front-panel, when the right end-cover has been removed, slide the front-panel assembly onto the metal base of the Printer as shown.

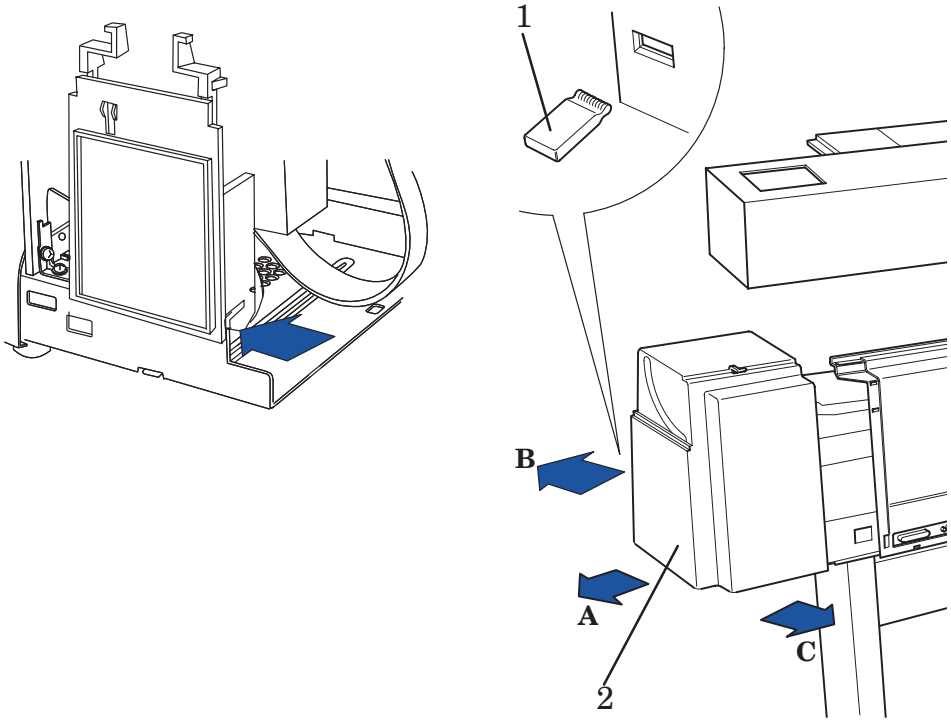


Figure 2: Right End-Cover

Removing the Front-Panel Assembly

Removal

1. Remove the left-end cover ➧ page 8-10.
2. When removing the front panel, lift (but do not remove) the brown or black clip in the J1 connector before removing the front panel (FP) cable. You don't need to use any force at all.

Be very careful when disconnecting the front panel connector from the Main PCA. If the cable is pulled too hard when removing the front panel it can damage the J1 front panel connector in the Main PCA which means that the complete electronics module has to be replaced. If you follow the instructions above, you will not damage the J1 connector:

Remember that the clip must not be removed completely. If removed completely, the clip will be destroyed.

Installation

1. When installing the front panel, pull the brown or black clip and insert the cable into the J1 connector. Once the cable is inside the connector, push the brown or black clip down to hold the cable in place. The conductive part (metallic part) of the cable must face the Main PCA.

REMEMBER THAT PULLING THE CABLE WITHOUT RELEASING THE BROWN OR BLACK CLIP WILL DAMAGE THE CONNECTOR IN WHICH CASE IT WILL DESTROY THE COMPLETE ELECTRONICS MODULE.

2. Make sure that the Front Panel cable is properly routed by the clips inside the Right-end cover and remains underneath the Spittoon at all times. If the Cable is not routed correctly, the Cutter Assembly can trap the cable and damage it.

Removing the Electronics Module

Refer to figure 3 ➧ page 14.

Important Information

The Printer firmware is contained either on a flash ROM SIMM at the back of the Printer or on a masked ROM inside the electronics module. The firmware-revision level, for example A.01.03, is printed by the Printer on the setup sheet and on the service configuration plot. The revision level is also printed on a label on any flash ROM SIMM. Do not open the electronics module.

Important: When replacing the electronics module, always remember to check the firmware revision level of the **new** electronics module. The revision level will be printed on the top surface of the module. Also, check the firmware revision level of the ROM SIMM installed in the **old** electronics module. With this information you must do the following:

1. If the firmware revision level of the ROM SIMM in the old electronics module is **lower** than the firmware revision level of the new electronics module, then you **must not** install the ROM SIMM into the module.
2. If the firmware revision level of the ROM SIMM in the old electronics module is **higher** than the firmware revision level of the new electronics module, then you **must** install the ROM SIMM into the module.

   Example 1: The ROM SIMM firmware revision level is A.01.03 and the firmware revision level of the electronics module is A.01.04. You would use the electronics module **without** the ROM SIMM installed.

   Example 2: The ROM SIMM firmware revision level is A.01.05 and the firmware revision level of the electronics module is A.01.04. You would use the electronics module **with** the ROM SIMM installed.

Removal

The electronics module is a field-replaceable part. You do not need to open it. If it is faulty, exchange it for a new one.

1. Remove the right end-cover ➧ page 8-11.
2. Disconnect the front-panel assembly from the main PCA.
3. Unscrew the cover plate at the back of the Printer, and remove it.
4. Remove one screw (item 1) and washer (item 2) from the back cover.

5. Remove one screw (item 3) and washer (item 4) from the floor of the electronics module (item 5).
6. Insert a flat-head screwdriver in to the slot at the back of the Printer to unlatch the electronics module from the back cover.
7. At the back of the Printer, ensure that the two small wire clamps of the parallel port are positioned flush against the electronics module
8. Push the electronics module towards the front of the Printer.
9. Pull the electronics module to the right to easily access the connectors.
10. Disconnect all cables from the visible part of the main PCA.

    Prevent tugging on the cables at the point of connection by leaving slack between the connectors and the clips.
11. Pull the electronics module further to the right and out of the Printer.
12. If you are changing the electronics module for a new one, remove the RAM SIMM (if installed) from the old module and install it into the new one. Refer to page 8-13 before installing the ROM SIMM from the old module into the new module.

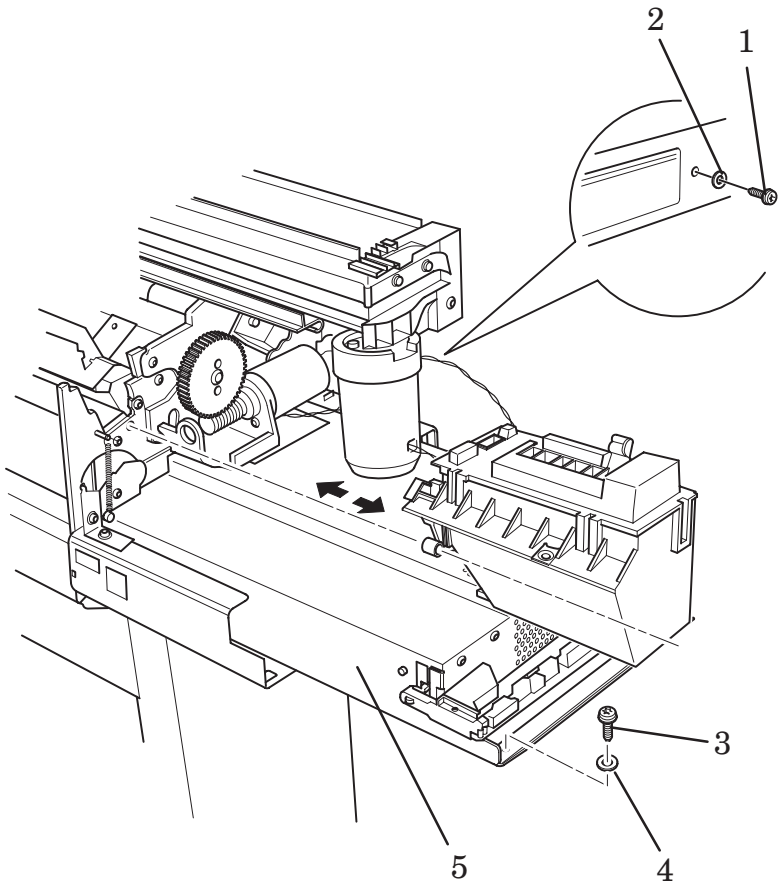


Figure 3: Electronics Module

Removing the Encoder Strip

Refer to figure 4 ➧ page 16.

Removal

1. Move the cartridge carriage to the left, over the service station.
2. Remove the right end-cover ➧ page 8-11.
3. Remove the left end-cover ➧ page 8-10.
4. Disconnect the trailing cable from the main PCA and from the guides on the right bracket. Fold the trailing cable upwards and store it on the trailing-cable guide.
5. On the right-hand side, remove the two nuts (item 1) that secure the encoder strip (item 2) to the encoder-strip spring (item 3).
6. Remove the screw (item 4) and washer (item 5) that secure the encoder strip to the left bracket (item 6).
7. Compressing the encoder-strip spring to release tension on the encoder strip, carefully release the encoder strip from the pin on the spring.
8. Carefully release the encoder strip from the left bracket.
9. Carefully pull the encoder strip to the right, through and out of the carriage assembly and lay it on a flat surface.

Installation

1. Move the cartridge carriage to the left, over the service station.
2. Ensure that the encoder strip is oriented with the transparent area up.
3. Feed the encoder strip through the cartridge carriage from right to left.
4. Temporarily, rest the loose strip safely on the drive roller.
5. Slip the left end of the strip over the plastic pin on the left bracket (item 6), and press it right to the base of the pin.
6. Loosely fit, but do not tighten, the washer (item 5) and screw (item 4) to retain the encoder strip.
7. Slip the right side of the encoder strip (item 2) over the two pins on the encoder-strip spring (item 3) and replace the two nuts (item 1) on the right side, and slightly tighten the nuts.
8. Slightly tighten the screw (item 4) on the left side.
9. Slide the carriage back and forth the length of its travel to ensure free movement. The encoder strip should not bind or rub on the carriage.

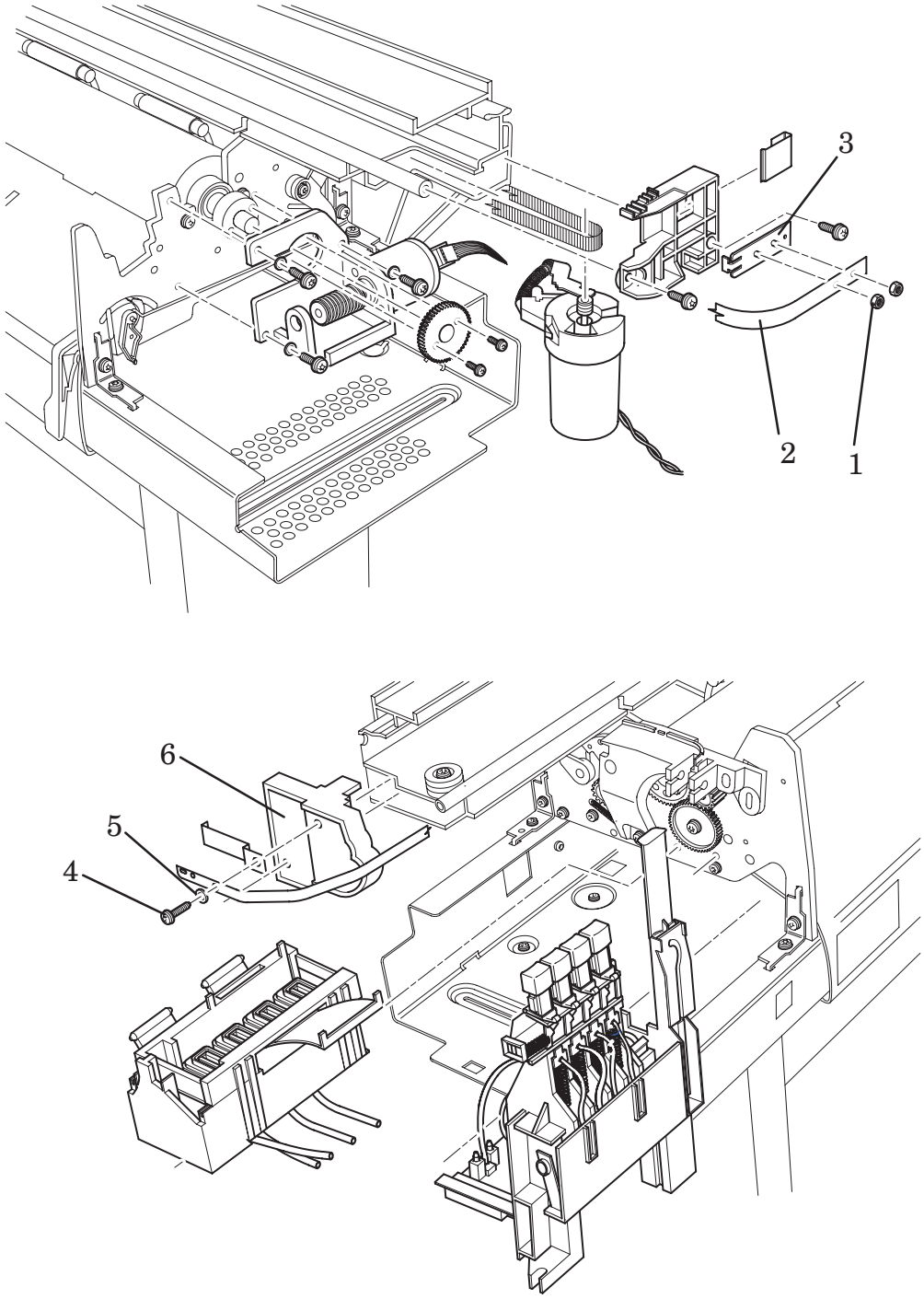


Figure 4: Encoder Strip

Removing the Right Bracket

Refer to figure 5.

Removal

1. Remove the encoder strip ➧ page 8-15.
2. Remove the screw (item 1) that attaches the right bracket (item 2) to the Printer chassis.
3. Pull the right bracket to the right, and remove it from the Printer.

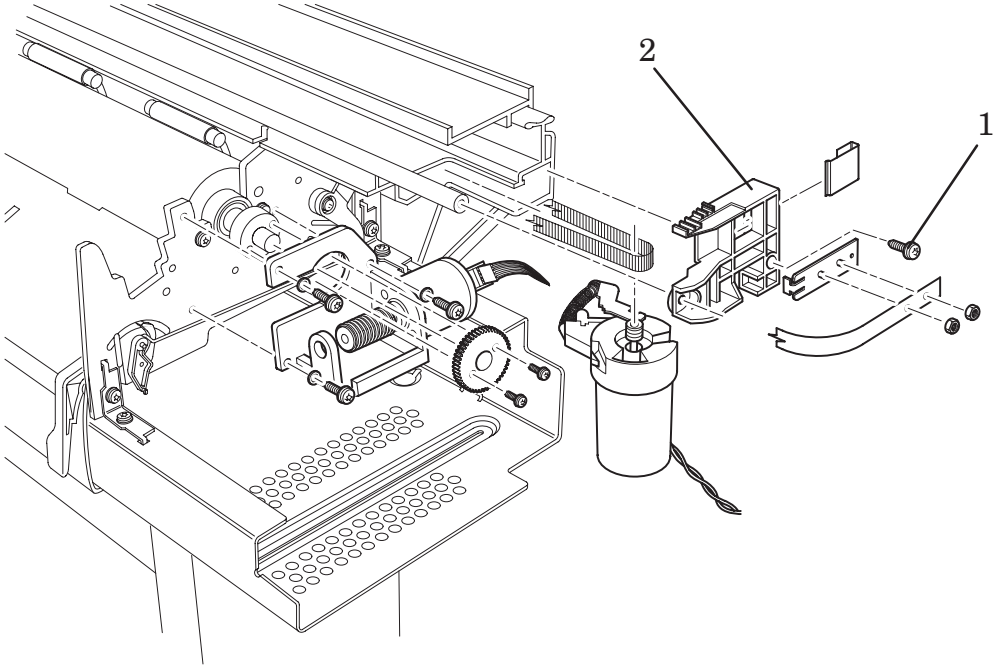


Figure 5: Right Bracket

Removing the Carriage Motor

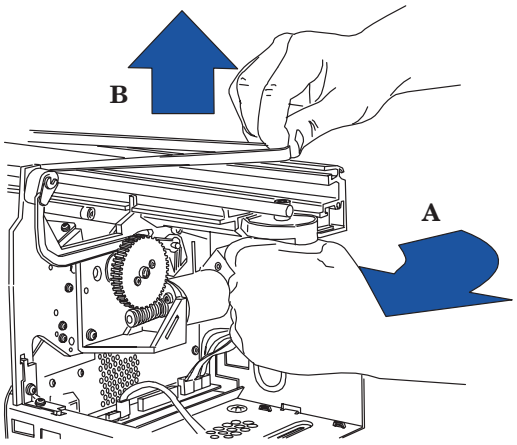
Removal

1. Remove the right bracket ➧ page 8-17.
2. Disconnect the carriage-motor cable from the main PCA (connector MOT Y), and from the clip at the back of the Printer.

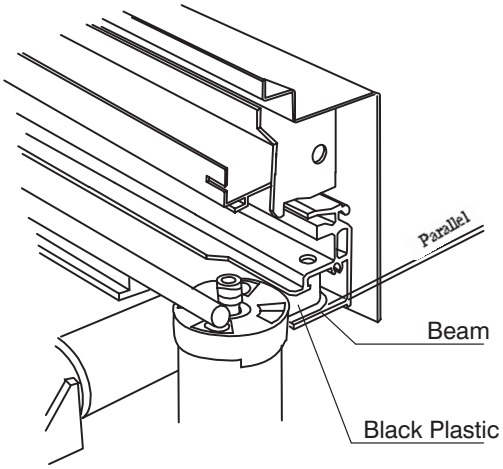
   In the following step, take care not to break the black plastic tab on top of the motor.

3. Press the carriage motor towards the left, and remove the belt from the motor shaft.

   If you need greater maneuverability of the motor, press the black plastic tab on top ***very slightly*** *downwards.*

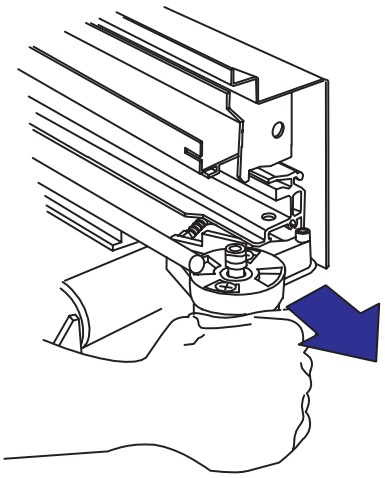


4. Slightly rotate the motor on its hinge until the indicated part of the black plastic is parallel with the side of the chassis beam.



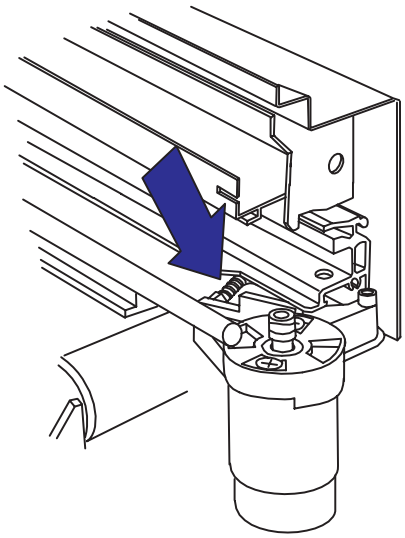
5. Pull the motor out to the right of the Printer.

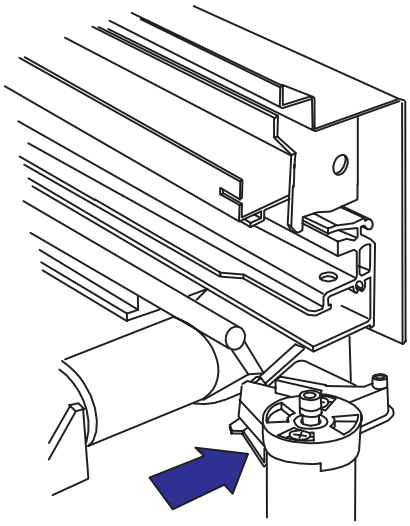
The motor may be stiff.



Installation

1. There is one spring on the motor assembly which fits onto the protruding plastic part on top of the motor. Position this part **inside** the chassis beam.





Also, make sure the belt is correctly positioned on the grooves of the shaft.

Removing the Spittoon

Refer to figure 6.

Removal

1. Remove the right end-cover ➧ page 8-11.
2. Remove the screw (item 1) and washer (item 2) that attaches the spittoon (item 3) to the right side-plate.
3. Rotate the Spittoon slightly and Slide it to the right, and remove it from the Printer.

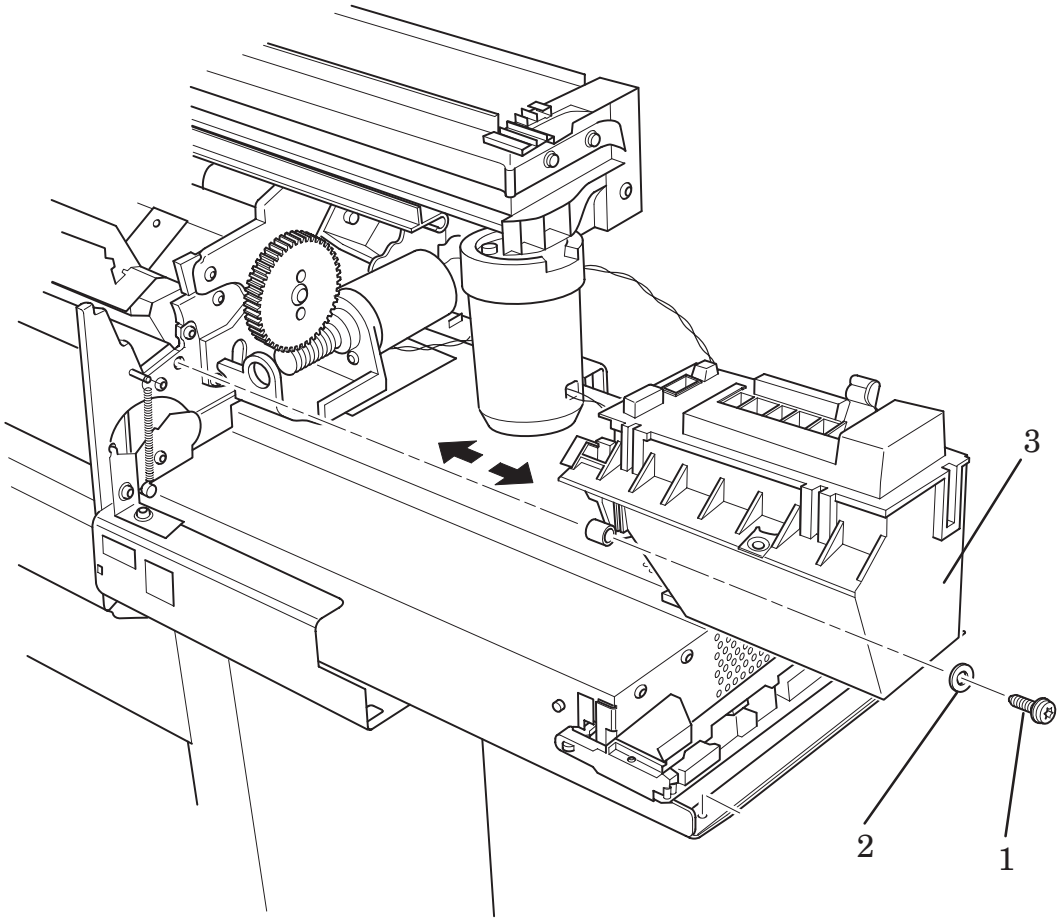


Figure 6: Spittoon

Removing the Cutter Assembly

Refer to figure 7.

Removal

1. Remove the Spittoon ➧ page 8-20.
2. Remove the right bracket ➧ page 8-17.
3. Slide the Cutter Assembly (item 1) (including the Cutter Bushing) out of the right side of the printer.

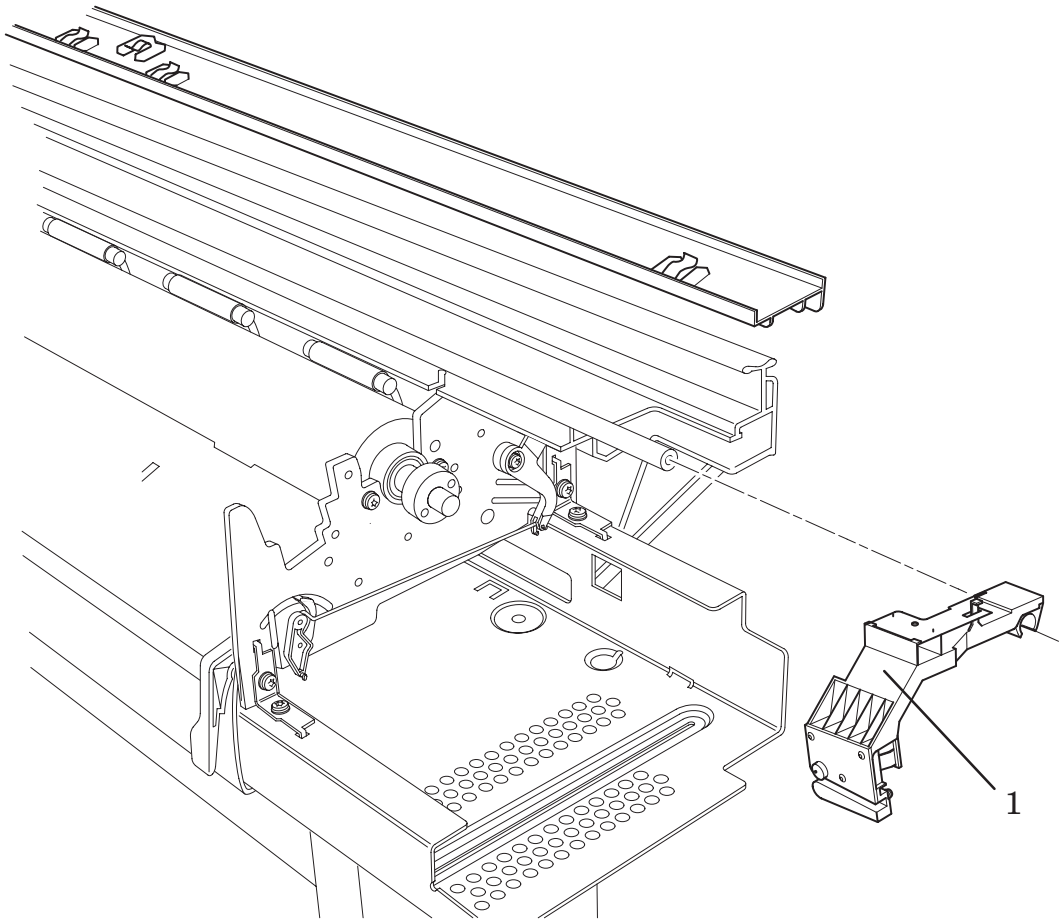
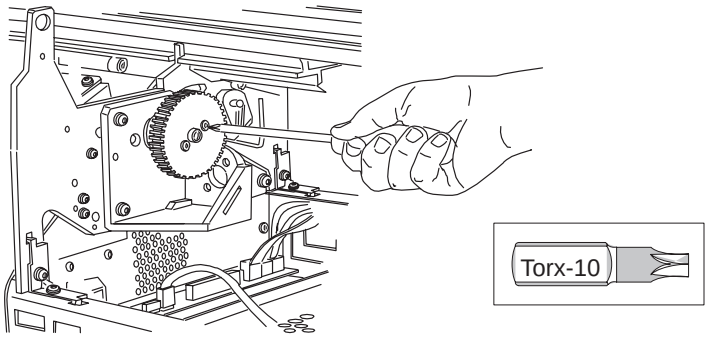


Figure 7: Cutter Assembly

Removing the Drive-Roller Gear

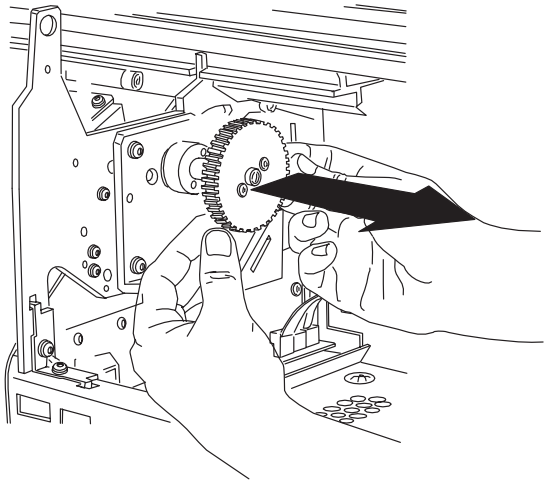
Removal

1. Remove the spittoon ➧ page 8-20.
2. Remove the two screws that secure the drive-roller gear to the drive-roller shaft.



3. Remove the drive-roller gear from the drive-roller shaft.

   The gear may be stiff.



Reassembling: *The worm pinion and drive-roller gear mesh slightly during use. Don't install a new motor and an old gear, or vice versa:* ***install the gear that comes with the motor.*** *Apply the grease that comes with the new motor to the worm pinion and drive-roller gear.*

Reassembling: *Push the gear onto the shaft as far as it will go. Align the holes on the gear with the holes on the shaft.*

Always calibrate the X-axis after reassembling the motor or the gear ➧ page 5-2.

Removing the Media Motor Assembly

Refer to figure 8.

Removal

1. Remove the spittoon ➧ page 8-20.
2. Remove the Drive-Roller Gear ➧ page 8-22.
3. Disconnect the media-motor cable and the flat media-axis-encoder cable from the main PCA (connectors labeled MOT X and ENC X respectively), and from the clip at the back of the Printer.
4. Remove the three screws (item 1) and washers (item 2) that secure the mounting bracket (item 3) to the Printer Chassis.
5. Remove the Mounting Bracket complete with the Media Motor Assembly.

   Reassembling: *The worm pinion and drive-roller gear mesh slightly during use. Don't install a new motor and an old gear, or vice versa:* ***install the gear that comes with the motor.*** *Apply the grease that comes with the new motor to the worm pinion and drive-roller gear.*

   Calibration: *After having reassembled the Printer, perform the accuracy calibration (Details ➧ chapter 5.)*

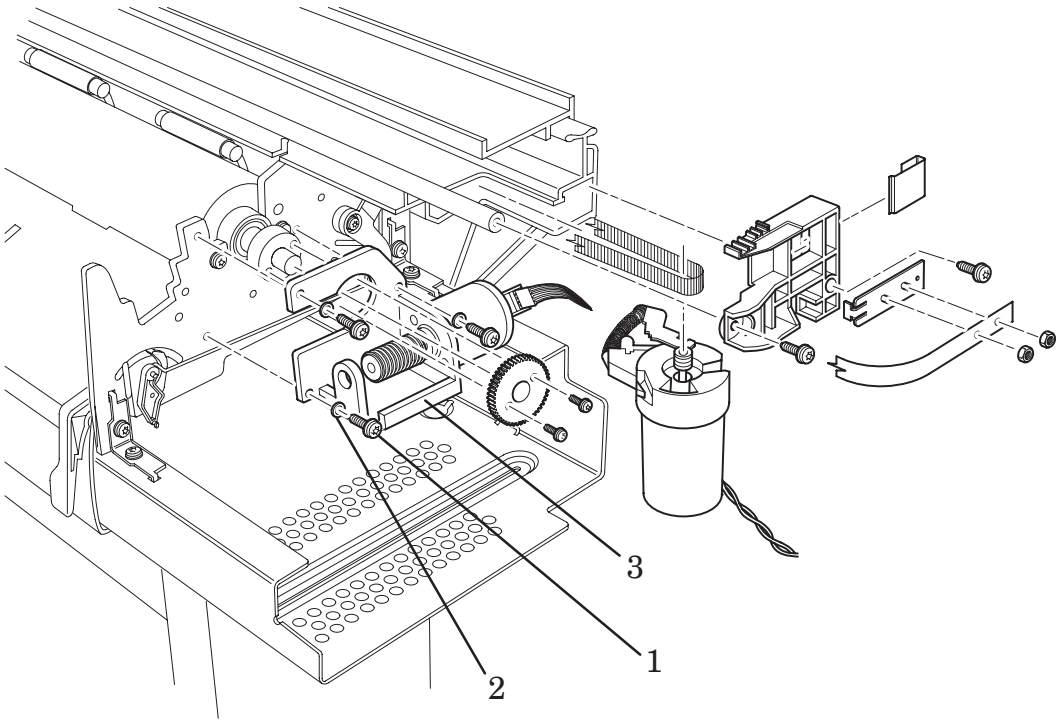


Figure 8: Media Motor Assembly

Removing the Pinch-Arm Mechanism

Refer to figure 9.

Removal

1. Remove the Media Motor ➧ page 8-23.
2. Remove one screw (item 1) and washer (item 2) that attaches the pinch-arm sensor (item 3) to the right side plate. Remove the Pinch-arm sensor (item 3).
3. Remove the spring (Item 4).
4. Remove one screw (item 5) that attaches the Pinch-arm lever (item 6) to the left piece of the right cam journal assembly (item 7). Remove the Pinch-arm lever (item 6).
5. Loosen one screw (item 8) that attaches the right cam journal assembly (item 9) to the Pinch-arm Bar Cam (item 10).
6. Remove the three parts of the right cam journal assembly (items 7, 9 and 11).

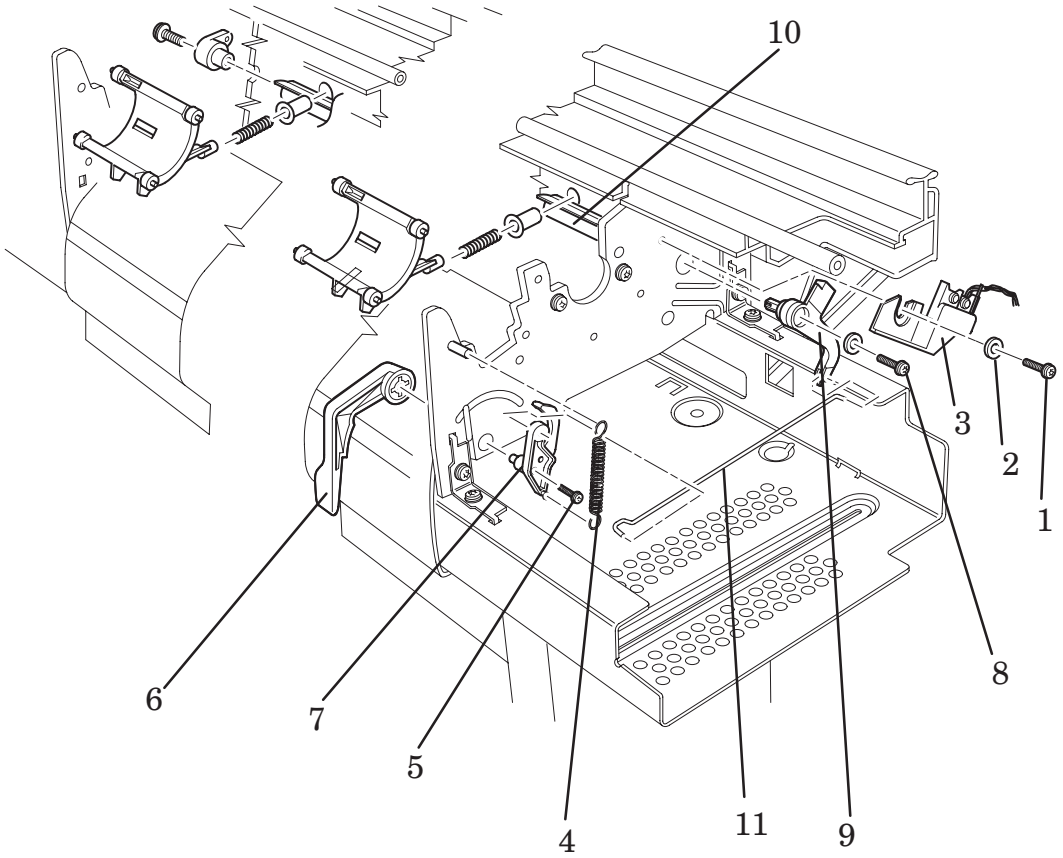
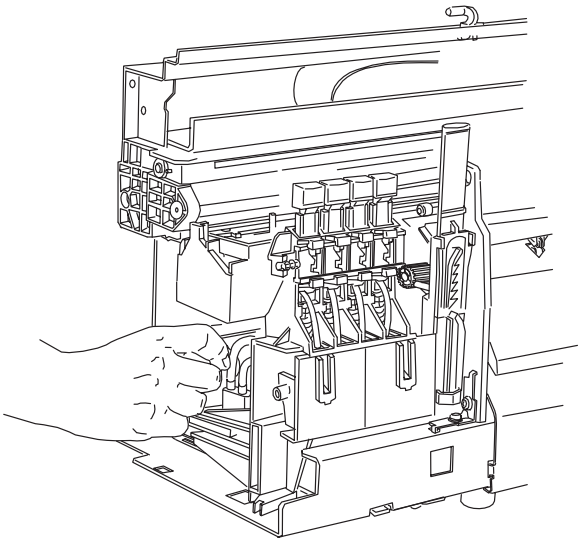


Figure 9: Pinch-arm Mechanism

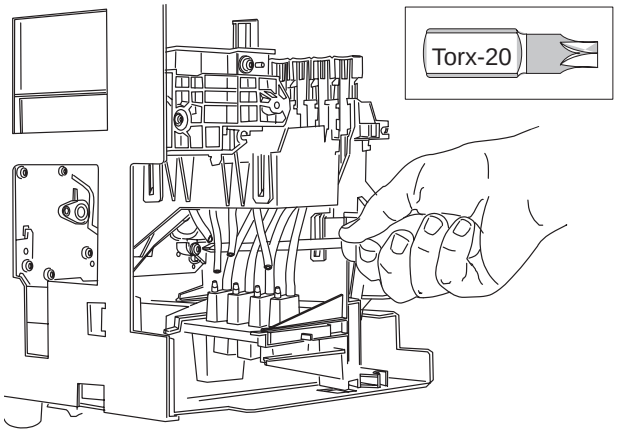
Removing the Primer Assembly

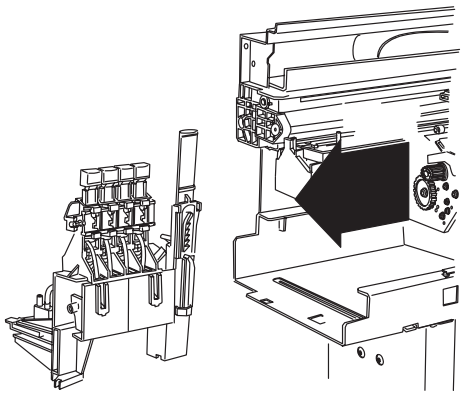
Removal

1. Remove the left end-cover ➧ page 8-10.
2. Disconnect the four **short** tubes from the ink separator.



3. Remove the screw that attaches the primer to the left side-plate.



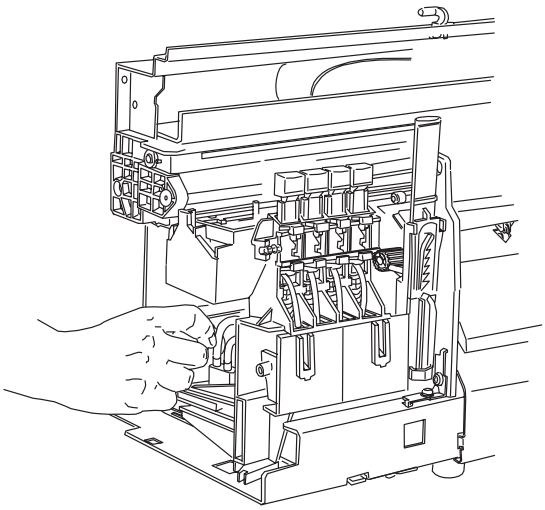


4. Slide the primer to the left, and remove it from the Printer.

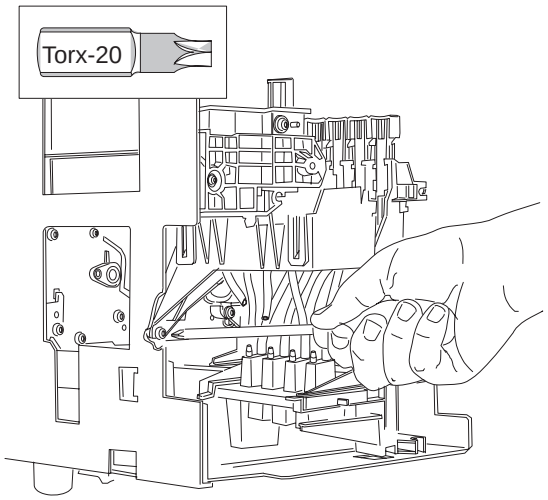
Removing the Service Station

Removal

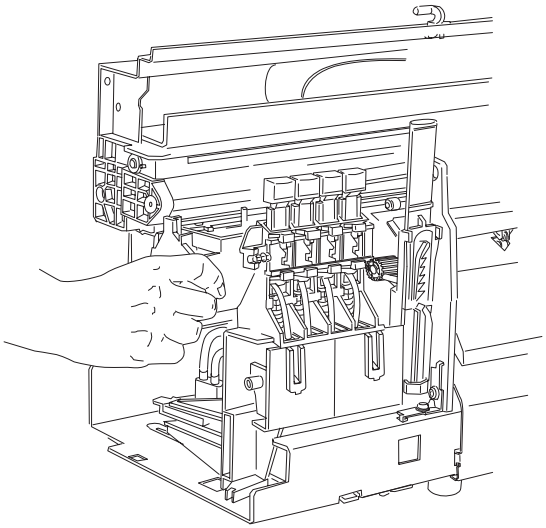
1. Remove the left end-cover ➧ page 8-10.
2. Disconnect the four **short** tubes from the primer ink separator.



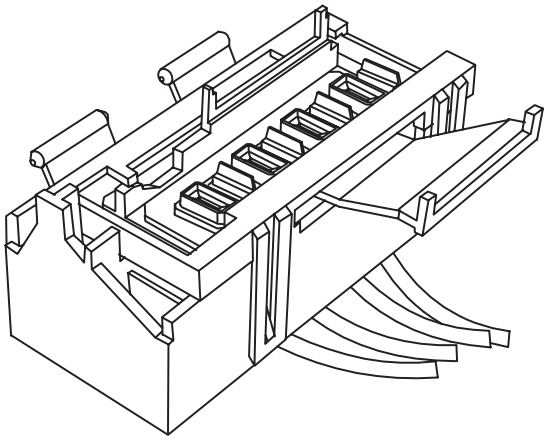
3. Remove the screw that attaches the service station to the left side-plate.



4. Slide the service station to the left, and remove it from the Printer.



The service station is one orderable assembly. Do not open it.

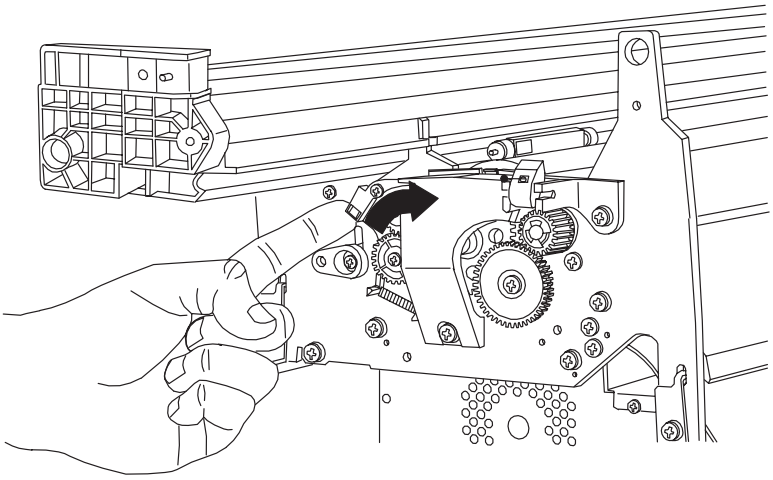


Reassembling: *Ensure that the cartridge caps are clean, the wipers straight, and the openings clear.*

Removing the Bail-Lift Mechanism

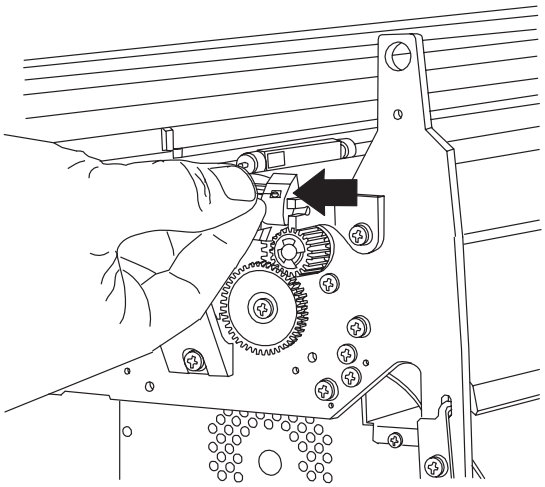
Removal

1. Remove the Bail Assembly ➧ page 8-7.
2. Remove the Primer Assembly ➧ page 8-25.
3. Remove the Service Station ➧ page 8-26.
4. **While** pushing the top of the bail-gear assembly towards the front of the Printer,



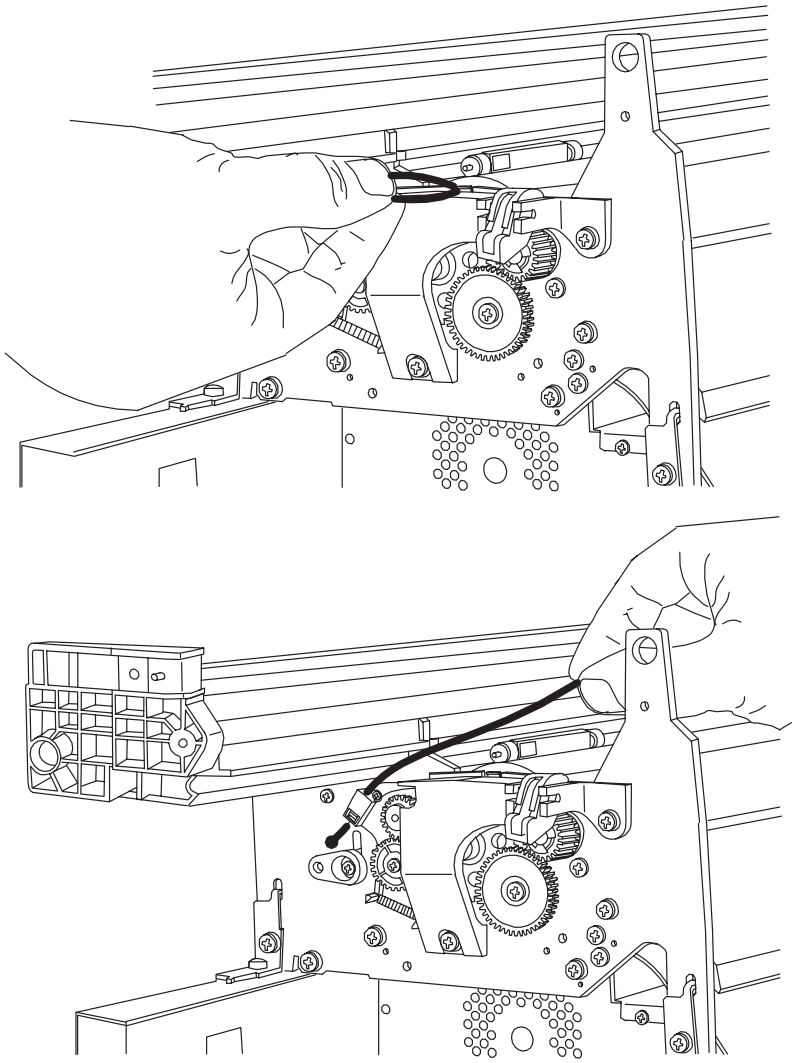
do the following:

1. On the engaging lever, move the cable ball slightly towards the back of the Printer.

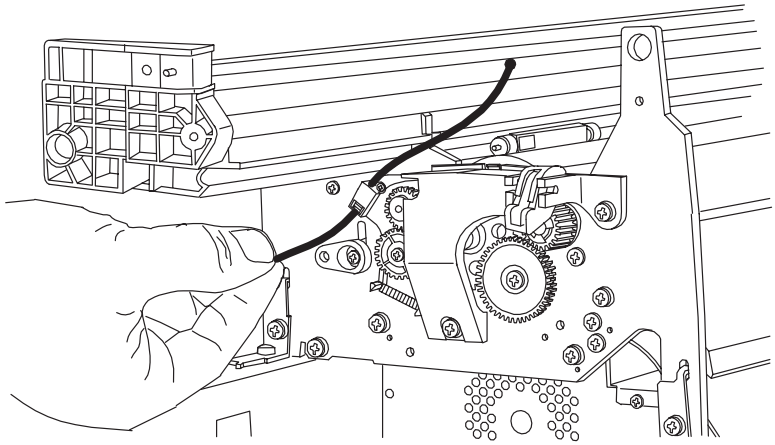


2. Allow the engaging lever to move towards the left of the Printer, so that the cable comes free of the lever.

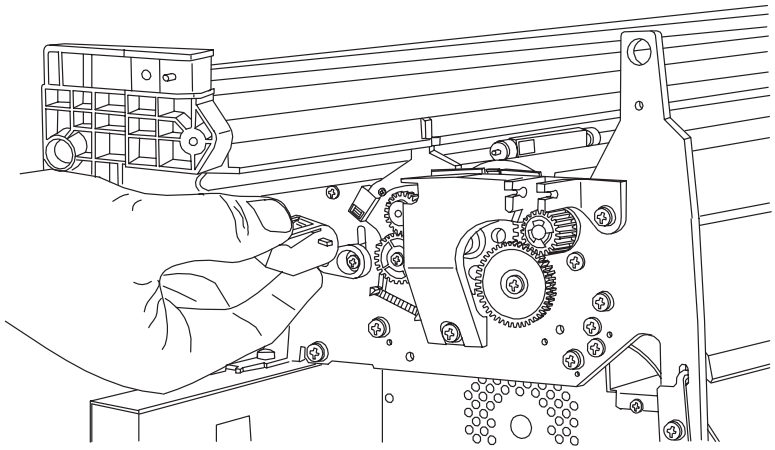
5. Release the cable from the engaging-lever support.



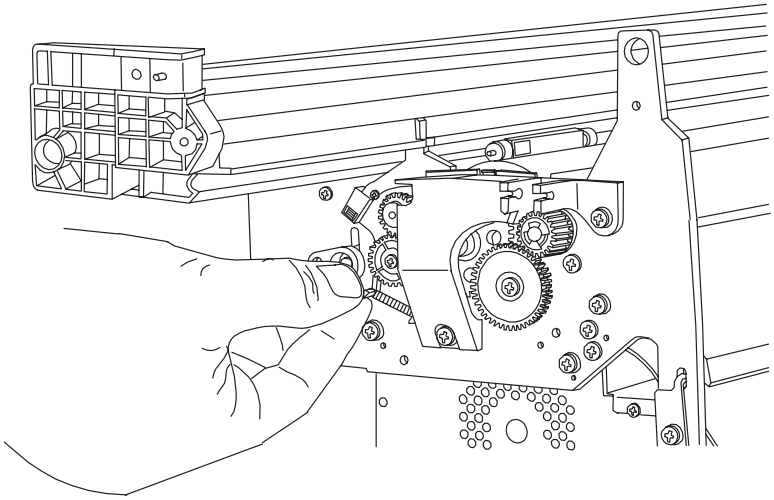
6. Release the cable from the bail-gear assembly.



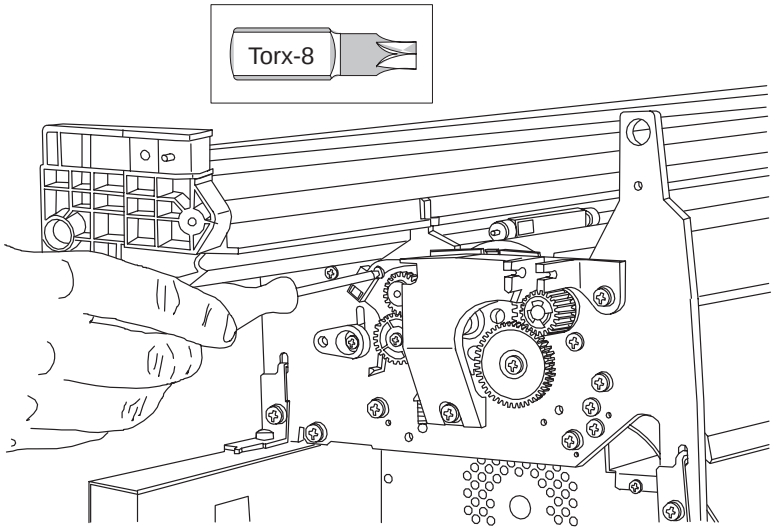
7. Remove the engaging lever.



8. Remove the spring from the bail-gear assembly.

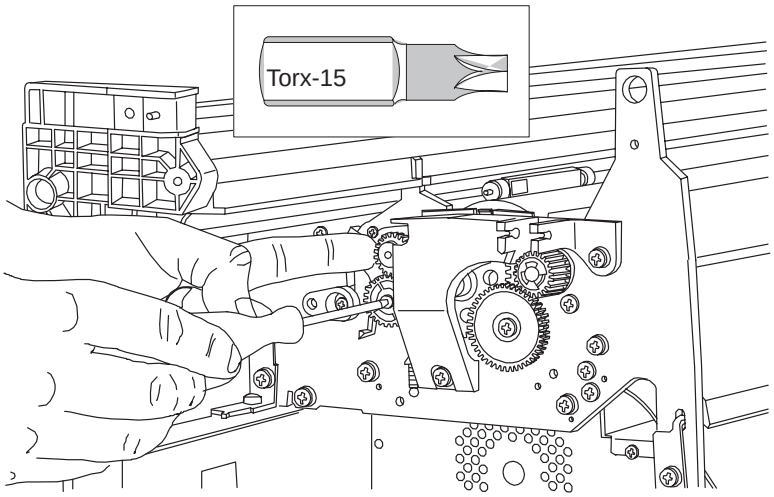


9. Loosen the screw from the top of the bail-gear assembly.



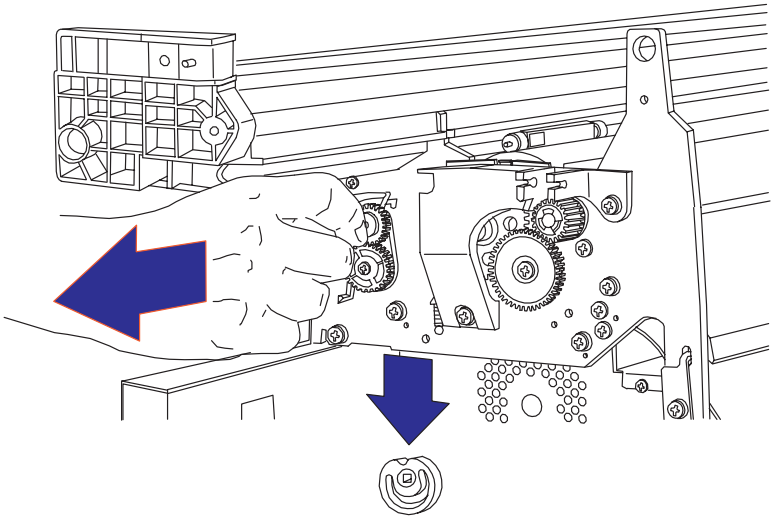
10. Remove the screw from the plastic bail gear.

    You may need to hold the bail cam steady inside the side-plate at the same time. You can access the cam through the hole underneath the side-plate.



11. Pull the bail gear assembly out from the Printer.

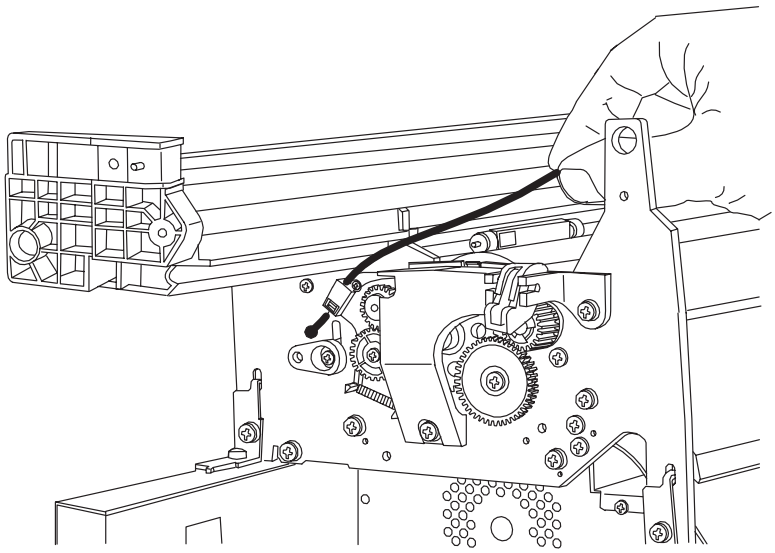
    The cam falls to the floor of the Printer.



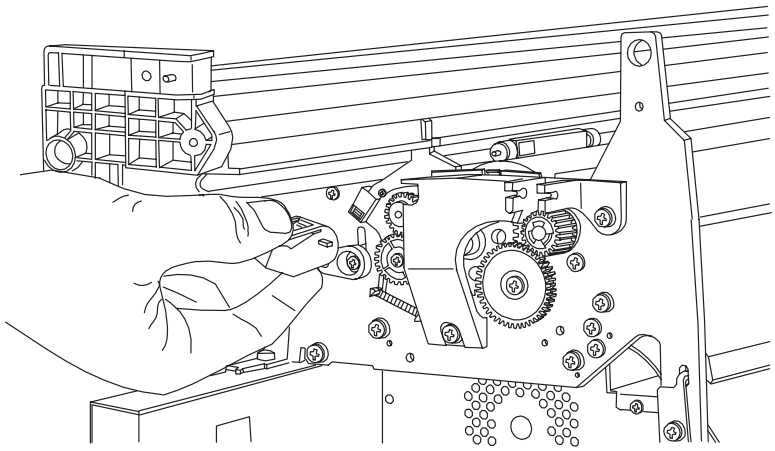
Removing the Engaging-Lever Support

Removal

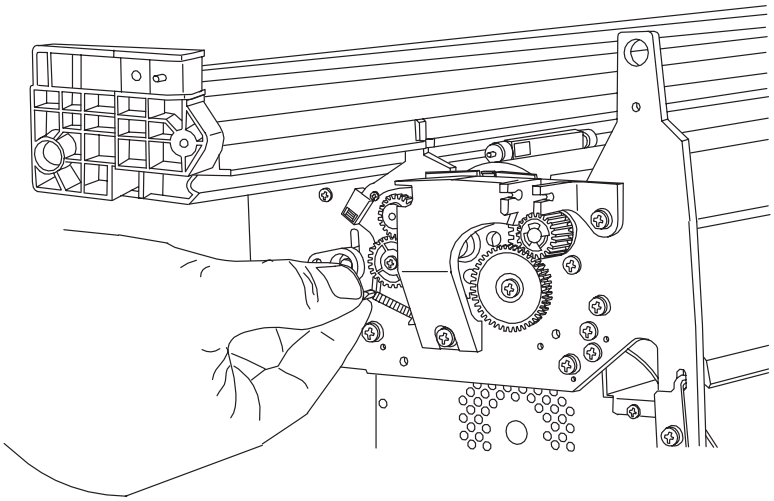
1. Remove the primer ➧ page 8-25.
2. Remove the service station ➧ page 8-26.
3. Release the cable from the engaging lever support ➧ page 8-28.



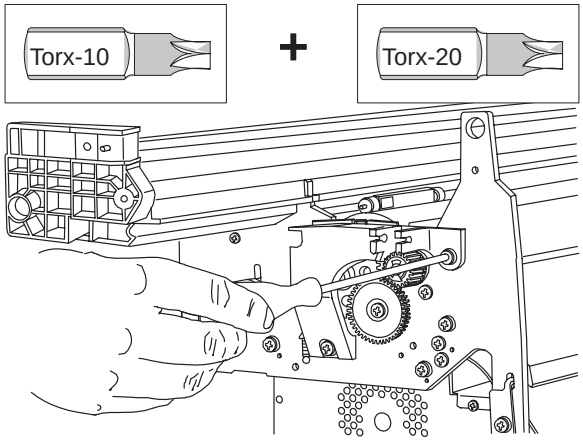
4. Remove the engaging lever.



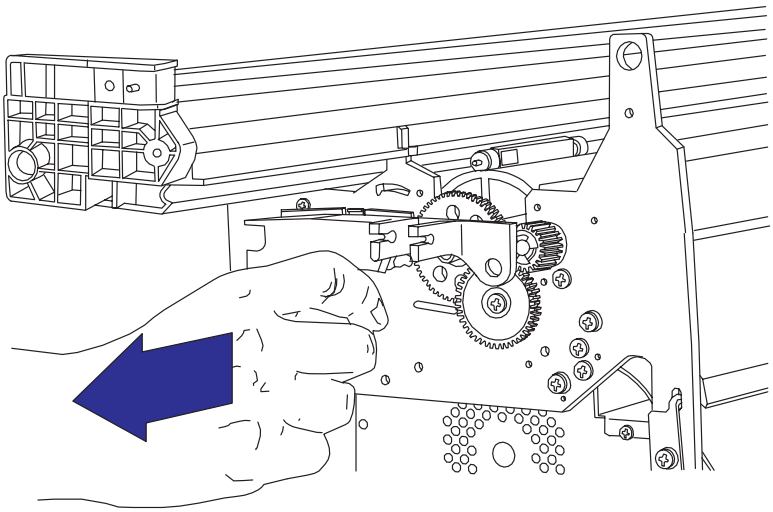
5. Remove the spring from the engaging- lever support.



6. Remove the three screws that attach the support to the left side-plate.



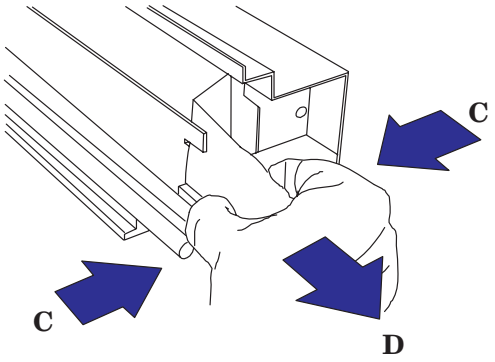
7. Pull the support upwards and remove it from the Printer.

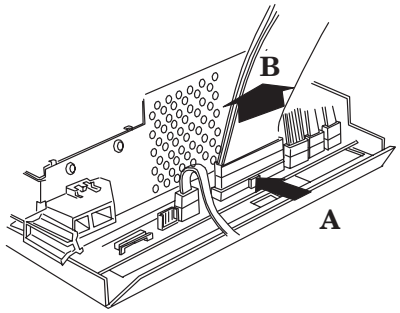


Removing the Trailing Cable

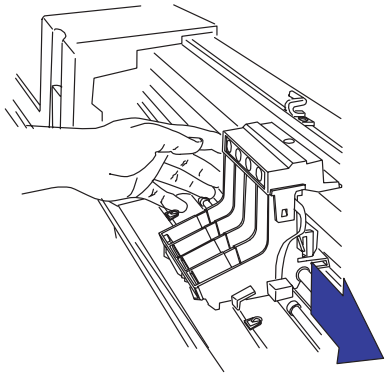
Removal

1. Remove the right end-cover ➧ page 8-11.
2. Disconnect the trailing cable from the connector marked P1 on the main PCA, and from the guides on the right bracket.

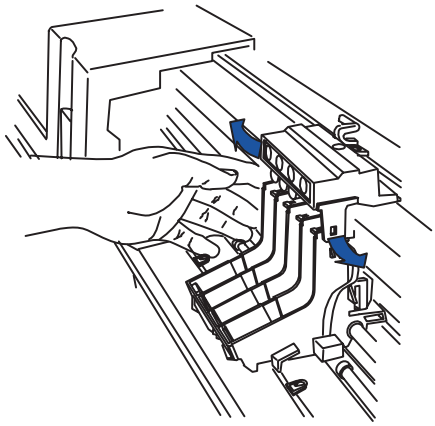


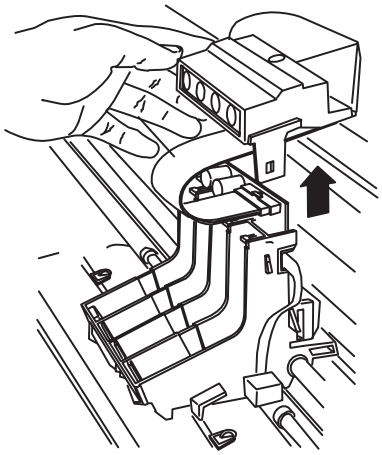


3. Move the carriage out of the service station.

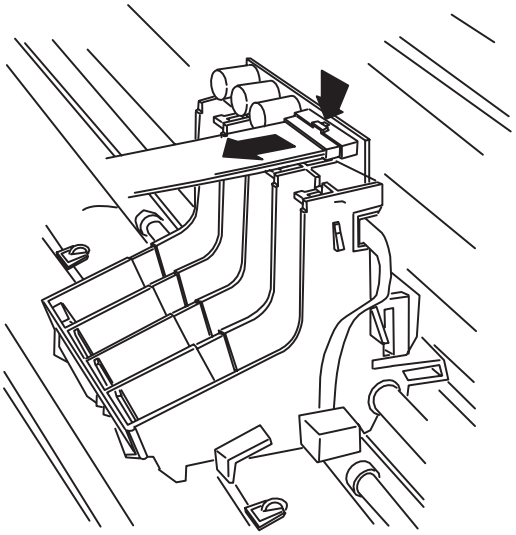


4. Release the two indicated clips on the top of the cartridge carriage by pulling them slightly outwards and pull the top of the carriage up.

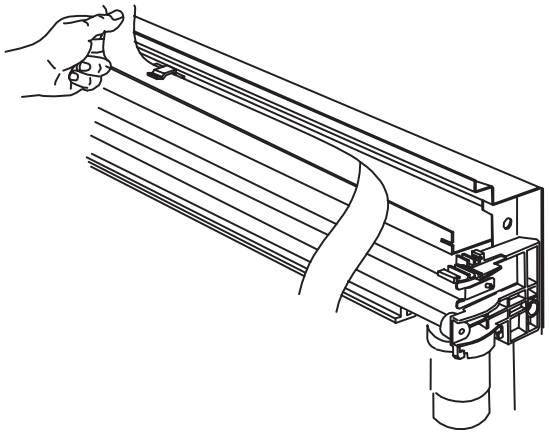




5. Disconnect the trailing cable from the connector on the carriage.



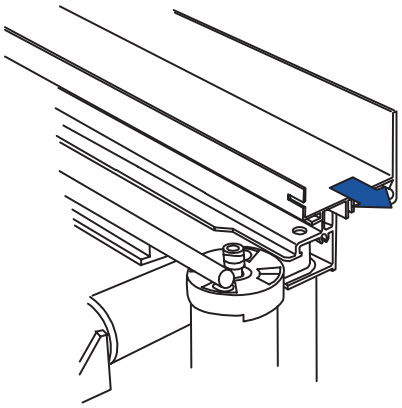
6. Release the trailing cable from the clips on the trailing-cable guide, and remove the trailing cable from the Printer.



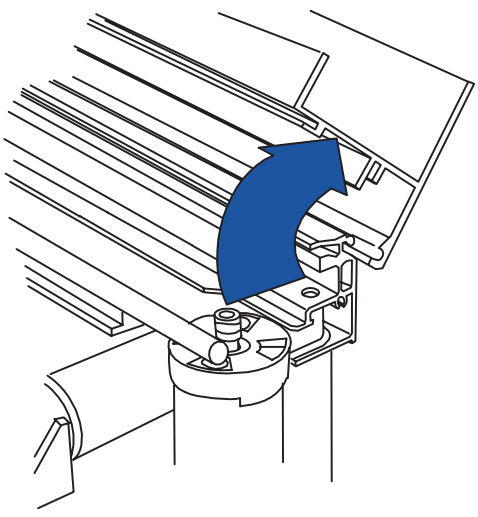
Removing the Trailing-Cable Guide

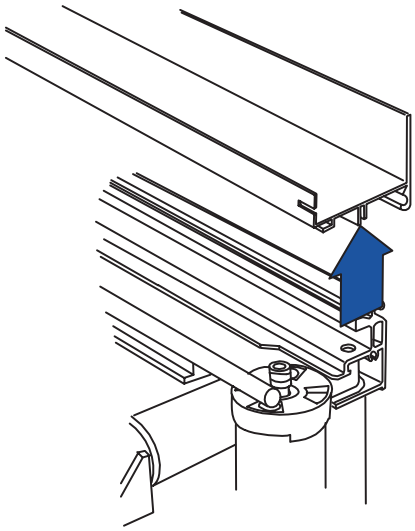
Removal

1. Remove the right bracket ➧ page 8-17.
2. Remove the back cover.
3. Remove the trailing cable ➧ page 8-34.
4. Slide the trailing-cable guide to the right, releasing it from the left-bracket tab.



5. Rotate the trailing-cable guide back on its hinge, until it clicks off from the chassis beam.





6. Remove the trailing-cable guide from the Printer.

Removing the Carriage Assembly

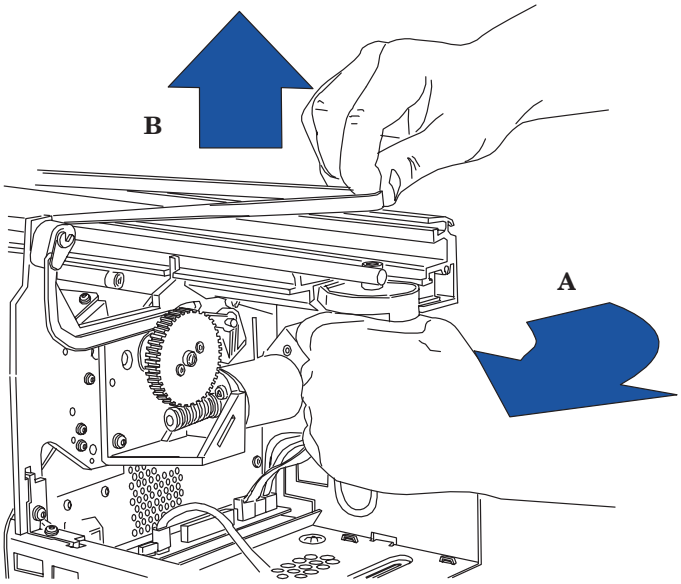
Removal

1. Remove the encoder strip ➧ page 8-15.
2. Remove the right bracket ➧ 8-17.

   In the following step, take care not to break the black plastic tab on top of the motor.

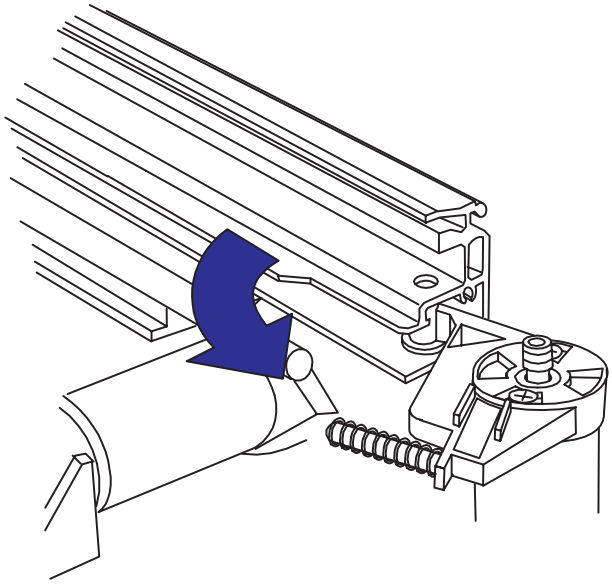
3. Press the carriage motor towards the left, and remove the belt from the motor shaft.

   If you need greater maneuverability of the motor, press the black plastic tab on the top ***very slightly*** *downwards.*



Reassembling: *Make sure the belt is correctly positioned on the grooves of the shaft.*

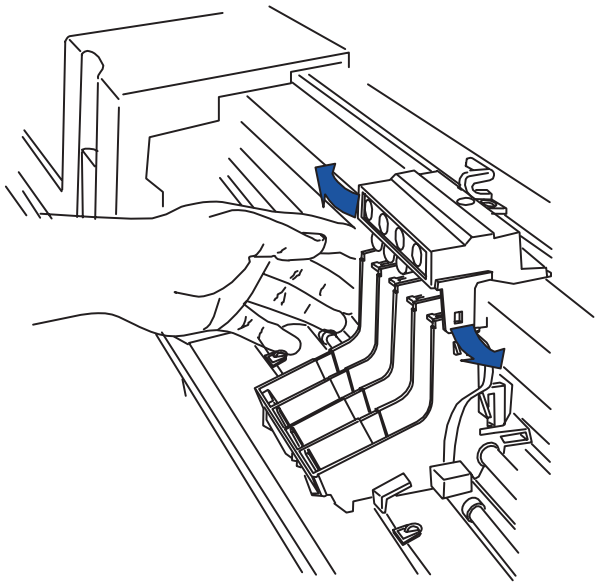
4. Rotate the motor on its hinge out towards the back of the Printer.



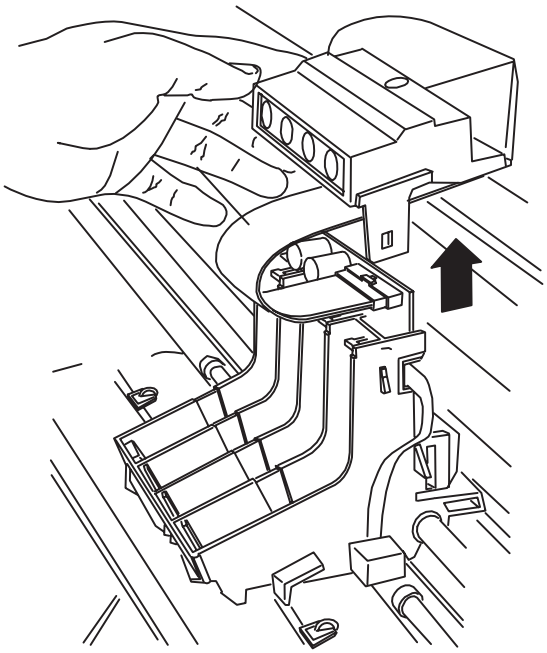
5. Release the belt from the pulley on the left of the Printer.

   Reassembling: *Make sure the belt is correctly positioned on the grooves of the pulley.*

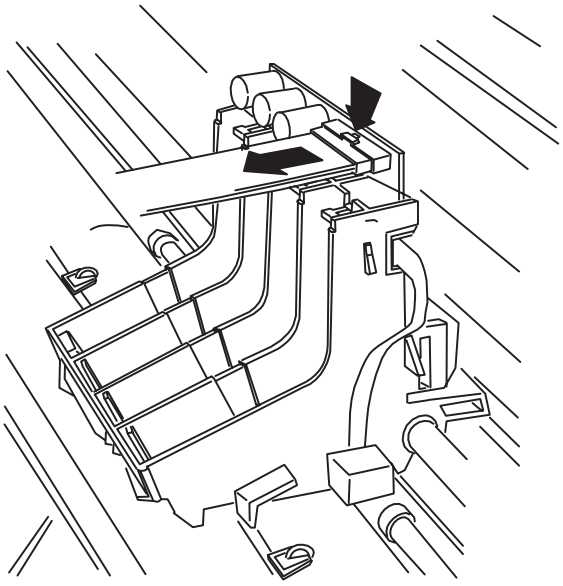
6. Release the two indicated clips on the top of the cartridge carriage by pulling them slightly outwards.



7. Pull the top of the carriage up.

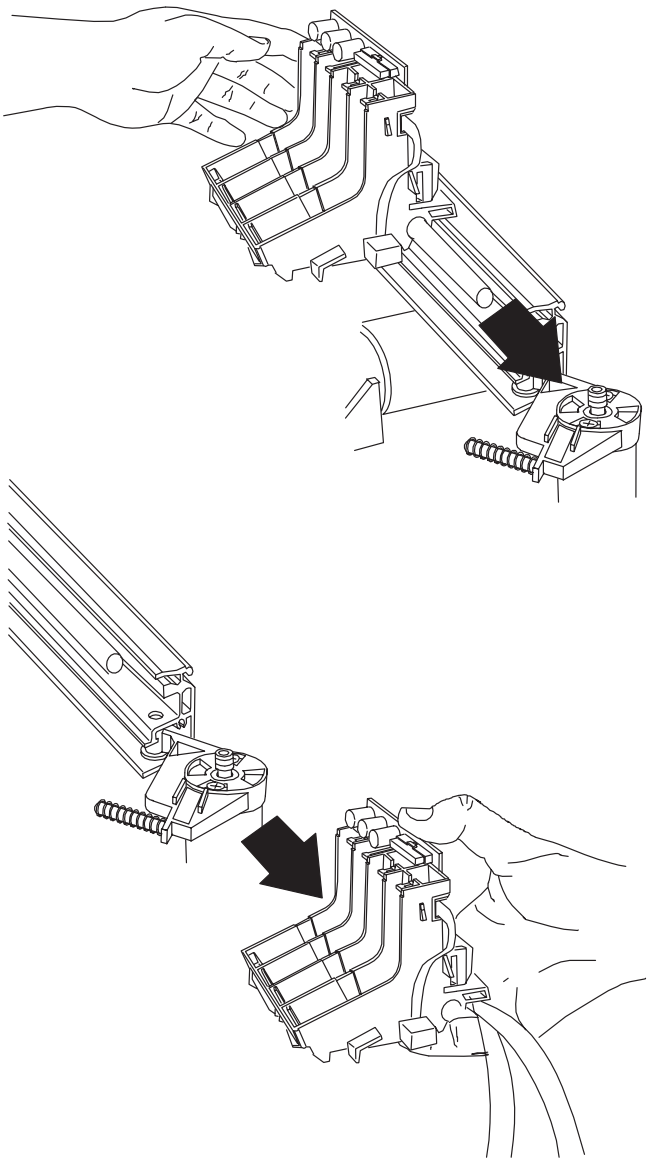


8. Disconnect the trailing cable from the connector on the carriage.



9. Rest the top of the carriage on the trailing-cable guide.

10. Slide the carriage to the right, and remove it with the belt from the Printer.



Reassembling: *Position the belt* ***under*** *the back extrusion of the carriage.*

Make sure that you correctly reconnect the trailing cable ➧ *page 8-8.*

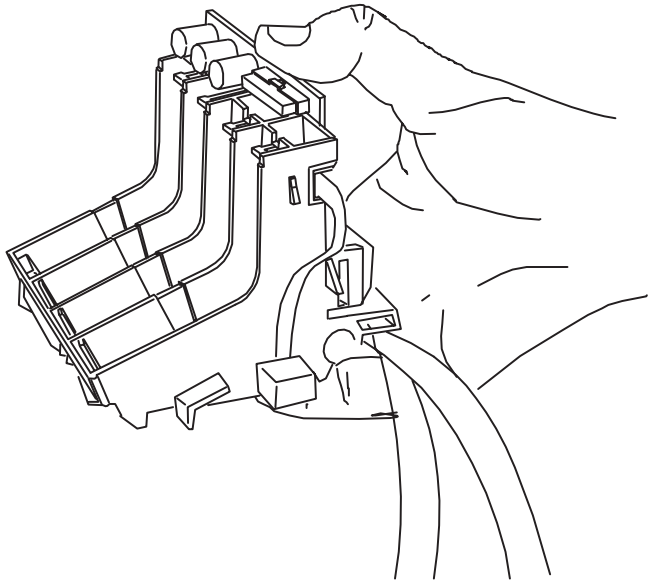
After reassembling, make sure that you check the carriage-to-media distance ➧ *page 5-5.*

Calibration: *After having reassembled the Printer, perform the black cartridge-alignment. (Details ➧ User's Guide.)*

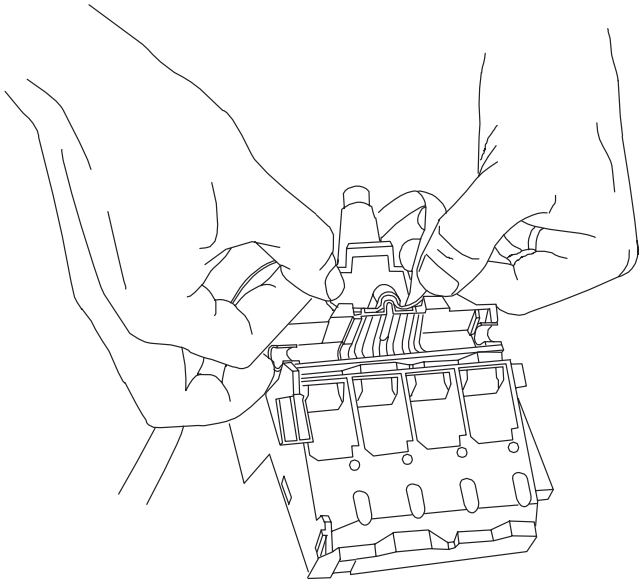
Removing the Drive Belt

Removal

1. Remove the Carriage Assembly ➧ page 8-37.



2. Release the belt from the clips on the underside of the carriage.



Reassembling: *Clip the belt to the carriage, using the same part of the belt as was originally used. Also, match the vertical lines on the belt with the vertical grooves on the carriage. The horizontal lines on the belt face outwards.*

Removing the Drive-Belt Pulley

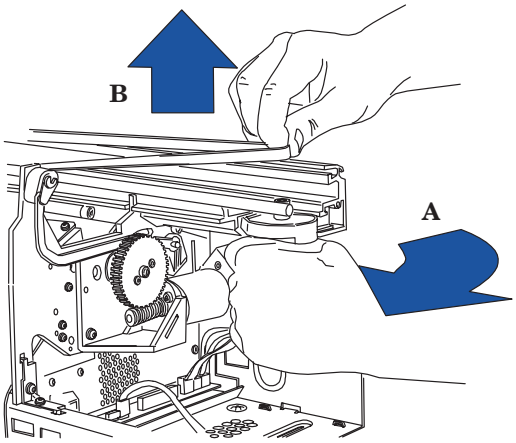
Removal

1. Remove the encoder strip ➧ page 8-15.

   In the following step, take care not to break the black plastic tab on top of the motor.

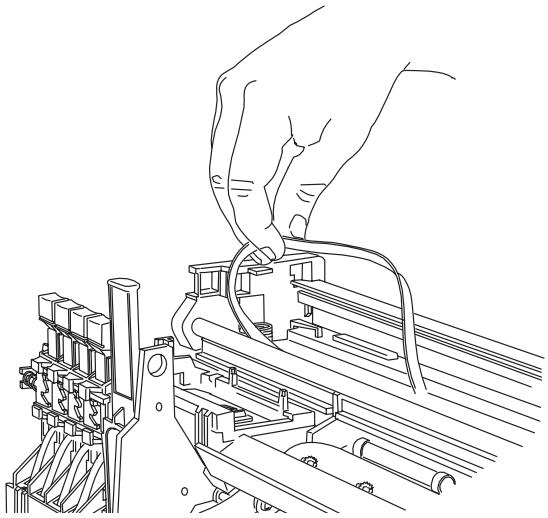
2. Press the carriage motor towards the left, and remove the belt from the motor shaft.

   If you need greater maneuverability of the motor, press the black plastic tab on top ***very slightly*** *downwards.*



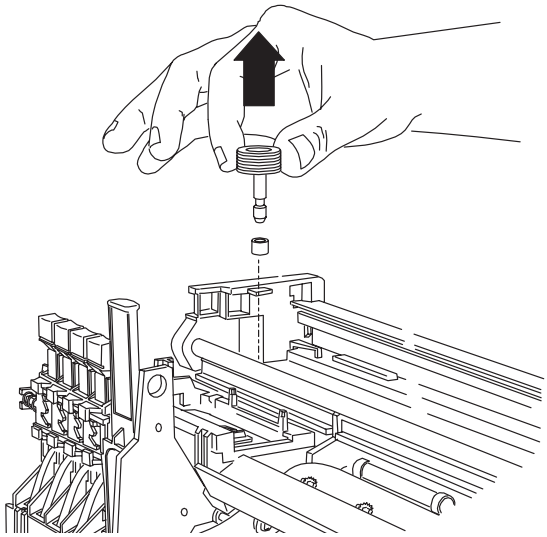
   Reassembling: *Make sure the belt is correctly positioned on the shaft grooves.*

3. On the left of the Printer, remove the belt from the pulley.



Reassembling: *Make sure the belt is correctly positioned on the pulley grooves.*

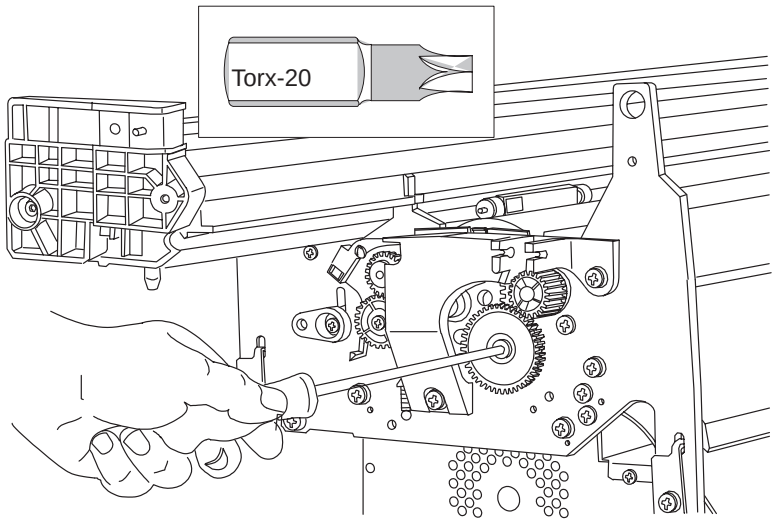
4. Underneath the left side of the chassis beam, release the black plastic clip and push the pulley shaft upwards.
5. Remove the pulley, shaft, and bushing from the Printer.



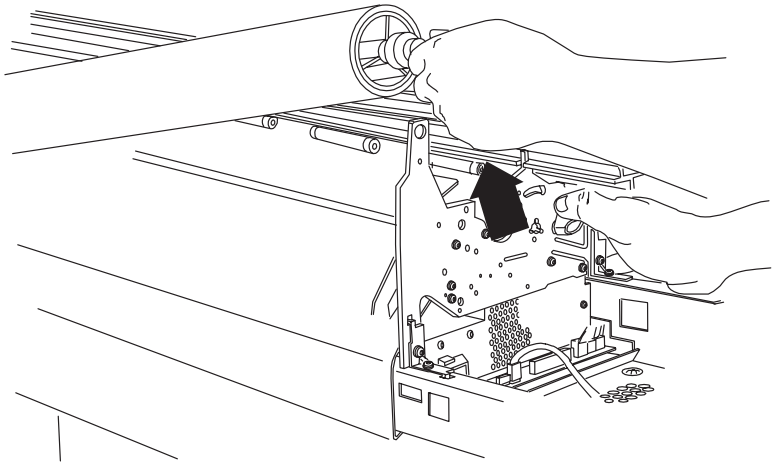
Removing the Drive Roller

Removal

1. Remove the Drive-roller Gear ➧ page 8-22.
2. Remove the Media Motor Assembly ➧ page 8-23.
3. Remove the Overdrive Assembly ➧ page 8-50.
4. Remove the Engaging-lever Support ➧ page 8-32.
5. Remove the large black plastic gear from the left side-plate.



6. Remove the overdrive assembly ➧ page 8-50.
7. Use the Pincharm Lever to raise the pinch-wheels, and lift the right side of the drive roller up.



8. Lift the roller out of the Printer.

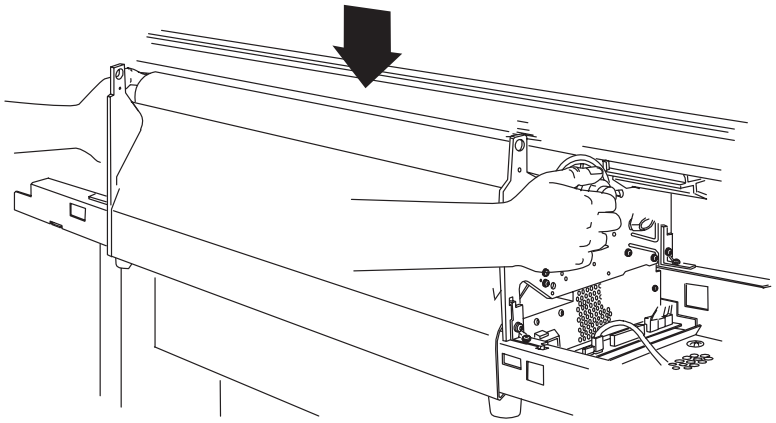
Reinstalling the Drive Roller

In the following procedure, take care not to injure your fingers if you let the drive roller snap into place.

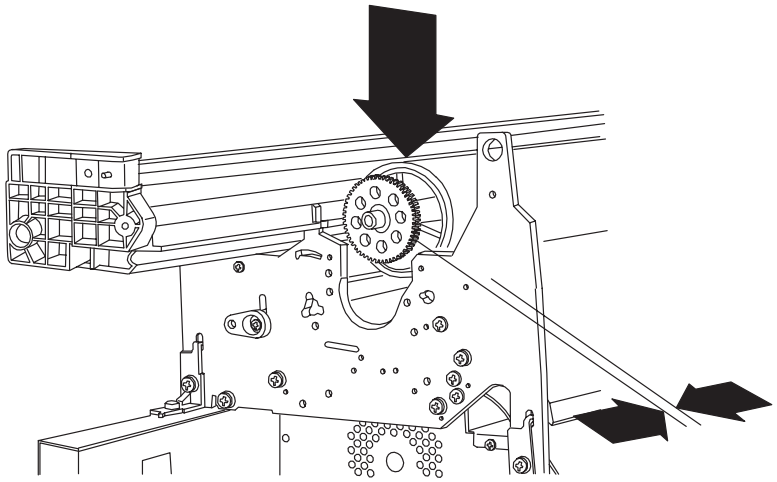
In the following procedure:

- Take care not to damage the media separator. Don't let it slip under the drive roller.
- Take care that the edge of the media separator does not damage the rubber surface of the drive roller.

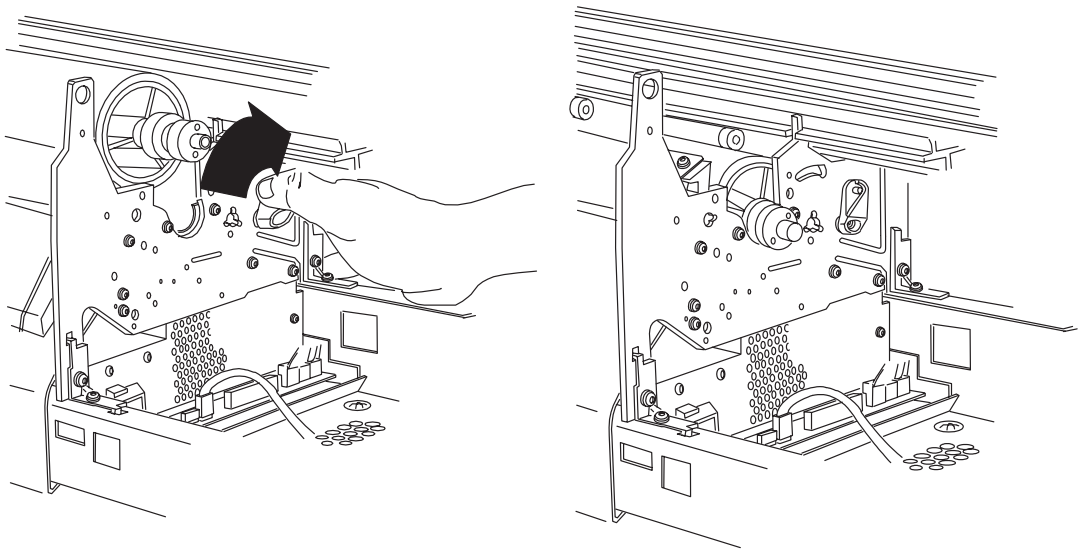
1. Position the Drive Roller on top of the pinch wheels.



2. Make sure that the gear on the left side of the roller is positioned immediately to the left of the side-plate.



3. Use the Pincharm Lever to lift the pinch-wheels, and let the roller drop into place.



4. Ensure that the bearing assembly at the right end of the drive roller is seated in the right sideplate and completely on the right side of the axial bias plate.
5. Replace the Overdrive Assembly ➧ page 8-50.
6. Replace the Media Motor Assembly ➧ page 8-23.

   Press down on the media mount as you replace the three screws. This is to ensure correct spacing between the drive roller and the cartridge nozzles.

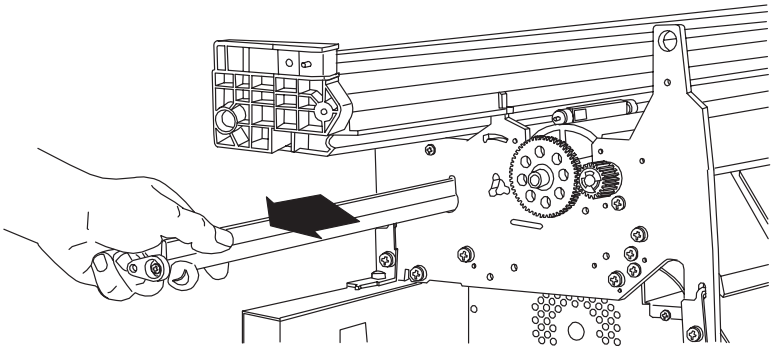
   Calibration: *Perform the accuracy calibration after reassembling the Printer. (Details ➧ chapter 5.)*

Removing the Pinch-Arm Lift Mechanism

Refer to figure 10 ➧ page 49.

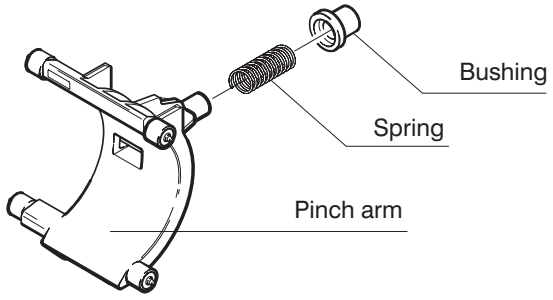
Removal

1. Remove the drive roller ➧ page 8-44.
2. Little by little, unscrew the cam-journal screw (item 1) on the right side, at the same time continually pushing the screw in towards the center of the Printer, until you feel that you have pushed the cam-journal **nut** out of the journal.
3. Pull the right cam-journal (item 2) out of the bar cam (item 3).
4. Grasp the left cam-journal (item 4) on the left side of the Printer.
5. Reach around to the front of the Printer and push the top of the bar cam slightly towards the rear of the Printer, simultaneously pulling the left cam-journal to the left, so that the bar cam can begin to slide out of the left sideplate.



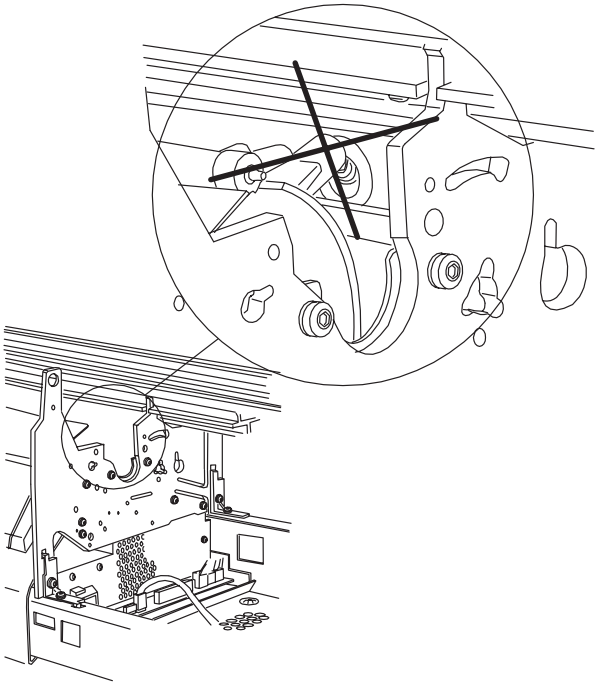
6. Slide the bar cam (item 3) to the left until it clears the pinch-arm assembly (item 5) you want to replace.
7. Remove the pinch-arm assembly and spring from the chassis.

   Take care that the spring does not fall.

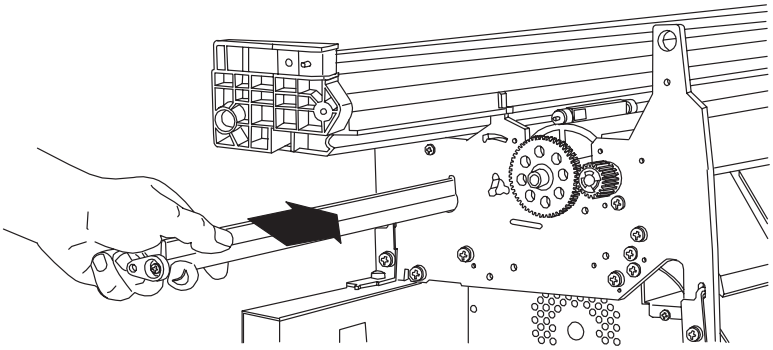


Installation

1. Reinsert the pinch-arm assemblies into the chassis. Make sure that the bushings are correctly inserted in the holes.



2. Slide the bar cam (item 3) to the right. You must position it ***between*** *the left and right side-plates, or the lift mechanism will not work.*



In the following step, do not overtighten the cam-journal screw. Doing so could break the journal, cause the bar cam to enter the side-plate hole, and thus restrict the action of the pinch-arm lever.

3. Before repositioning the right cam-journal (item 2), tighten its nut just to the point where the nut is inside the journal. Reinstall the journal and slightly tighten the screw (item 1).

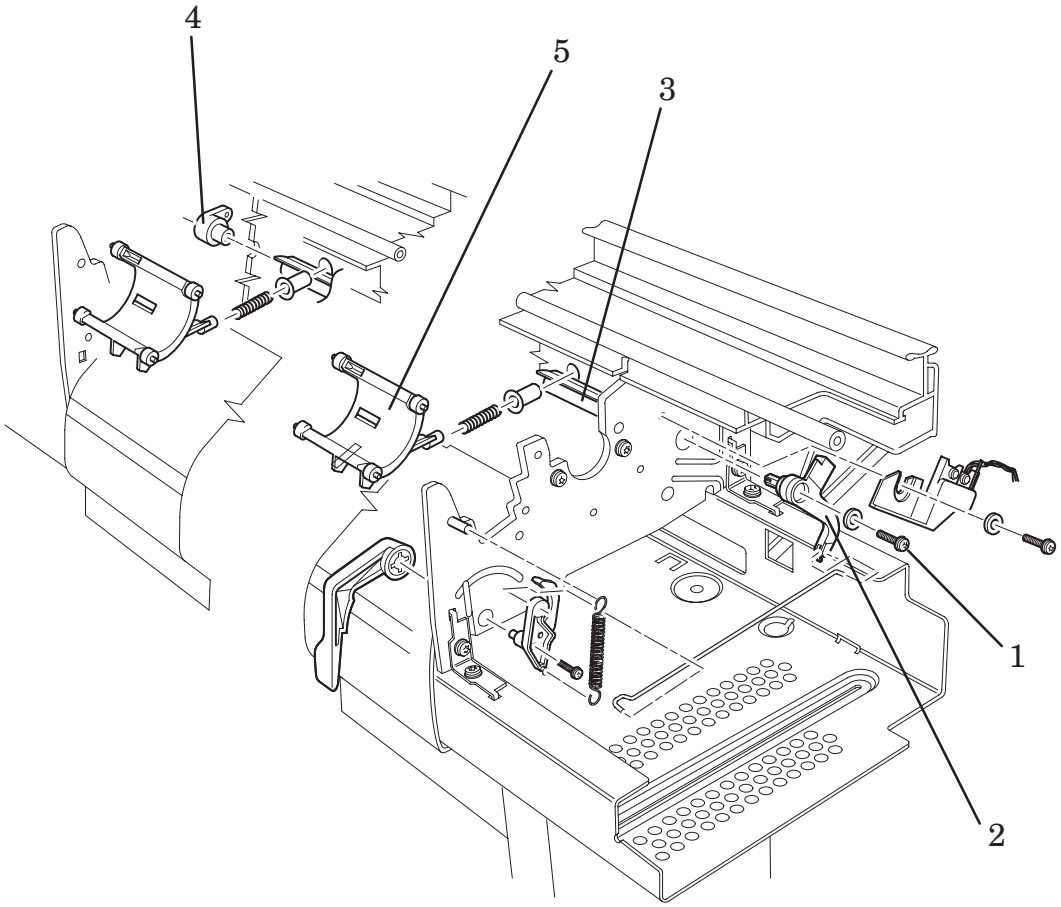


Figure 10: Pinch-arm Lift Mechanism

Removing the Overdrive Assembly (including the Overdrive Roller, Media Separator, Media Deflectors and Media Sensor)

Refer to figure 11 ➧ page 51.

Removal

1. Remove the Spittoon ➧ page 8-20.
2. Remove the Primer Assembly ➧ page 8-25.
3. Remove the Service Station ➧ page 8-26.
4. Disconnect the media-sensor cable from the main PCA (connector labeled MEDIA).
5. Remove the clutch retaining ring (item 1) that secures the overdrive clutch (item 2) to the overdrive roller (item 3).
6. Slide the overdrive clutch (item 2) to the left and remove it from the overdrive roller (item 3).
7. Remove two screws (item 4) from the right side of the printer and one screw (item 5) from the left side.
8. Loosen one screw (item 6) on the left side, but do not remove it.
9. Lift the complete Overdrive Assembly (item 7) (which includes the overdrive roller, media separator, media deflectors and media sensor) from the printer.

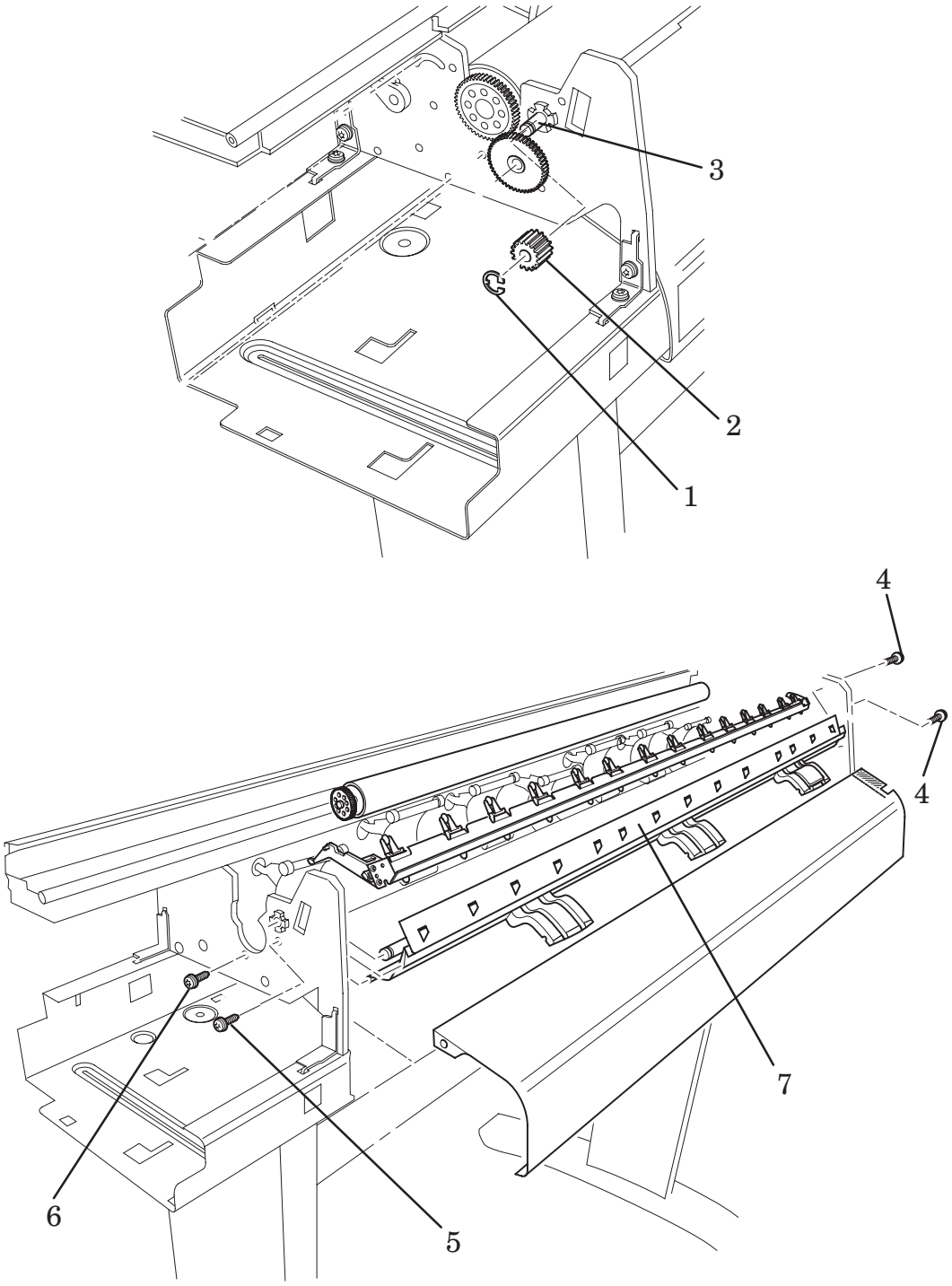


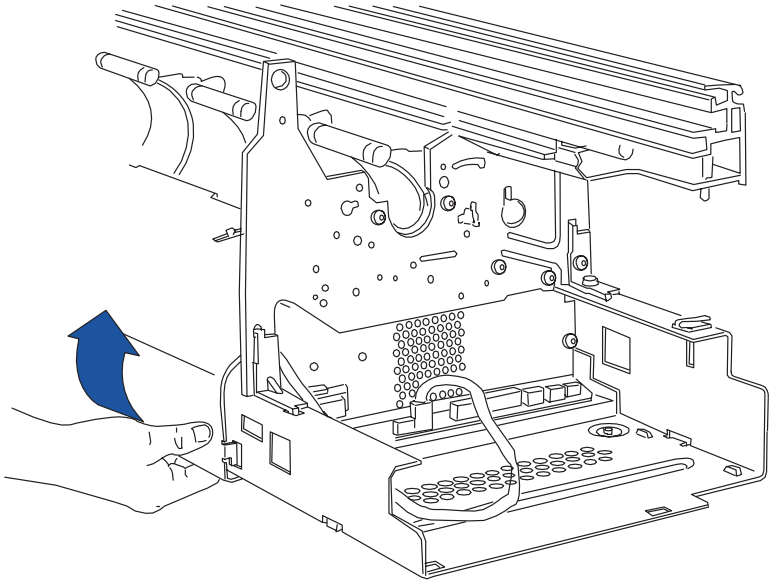
Figure 11: Overdrive Assembly

Removing the Entry Platen

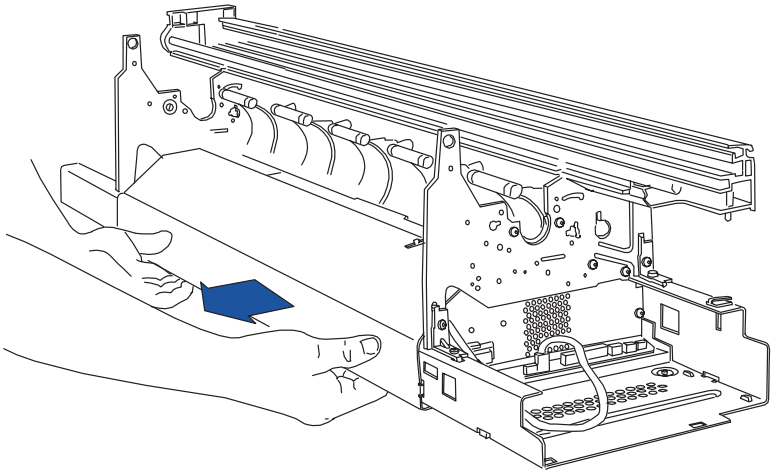
Refer to figure 12 ➧ page 54

Removal

1. Remove the Overdrive Assembly ➧ page 8-50.
2. Remove the screw (item 1) that attaches the entry platen (item 2) to the right side-plate.
3. Remove the screw (item 3) that attaches the entry platen (item 2) to the left side-plate.
4. Release the indicated entry-platen clips by pushing the bottom front corners of the entry platen up.

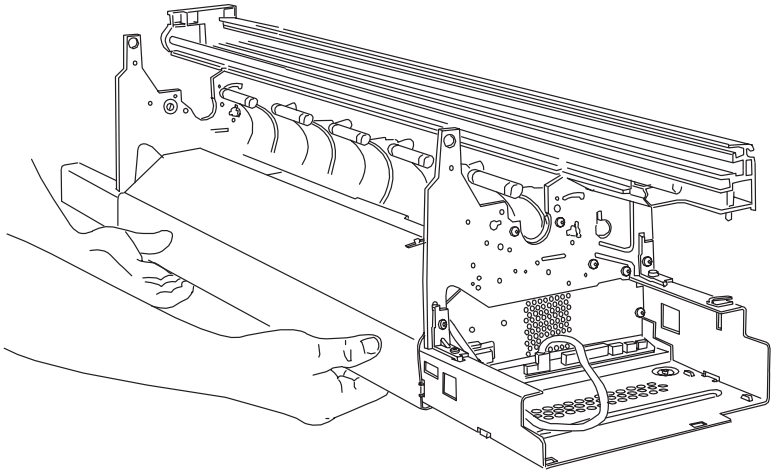


5. Pull the entry platen horizontally out from the Printer.



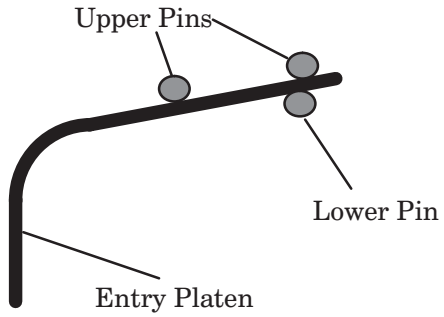
Installation

1. Position the entry platen between the two side-plates.

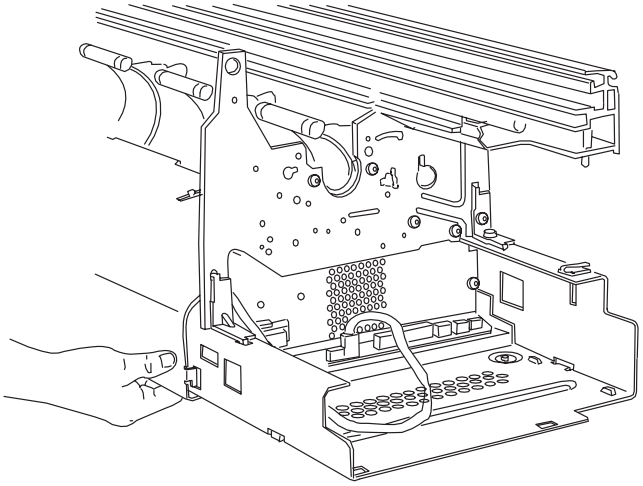


2. Slide the top of the entry platen in, and correctly position it on the inside of each side-plate.

   *On each side-plate, the **upper** two pins should touch the entry platen above it and the lower pins should touch the entry platen below it.*



3. Refasten the indicated entry-platen clips.



4. Inserting a screwdriver under the side-plate on the right of the entry platen, lever the entry platen over to the left, so that it is flush against the left side-plate.

   *There must be no space between the entry platen and the **right** side-plate. It doesn't matter if there is a small space between the entry platen and the **left** side-plate.*

5. Replace the screw (item 1) on the right-hand side and the screw (item 3) on the left-hand side.

1. Tighten the screws, making sure that the entry platen is aligned tight against the right side-plate.

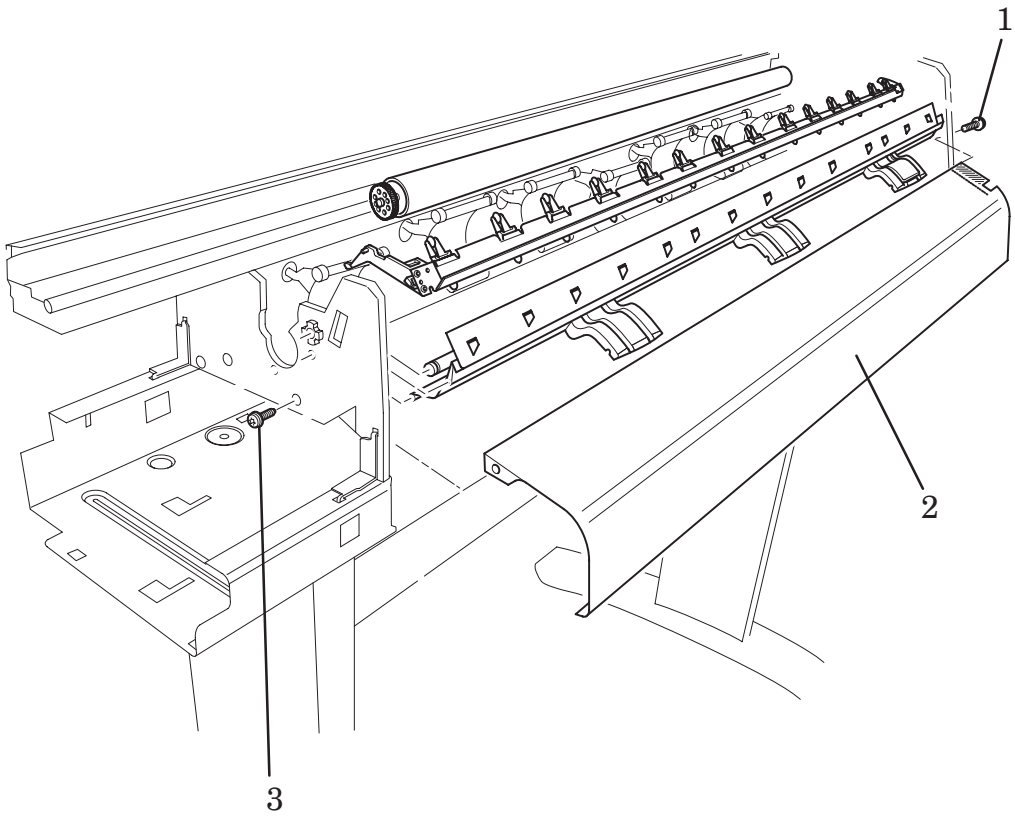


Figure 12: Entry Platen

9

Preventive Maintenance

Moisture on Printer

Users should use the Printer in an environment between 5% and 95% relative humidity. To recover from moisture condensation, turn the Printer off, and, using the main roller as a reference, wait until the Printer is completely dry before using it again.

Level of Printer Usage

To achieve good performance and long lifetime of the HP DesignJet 430/450C/455CA Printers, users should limit use to the following recommendations (duty cycle):

Average number of plots per day	Maximum number of plots per day
10 E/A0 CAD plots	20 E/A0 CAD plots

The service configuration plot gives an indication of how much the Printer has been used: number of plots, number of cartridges, number of times the Printer has been turned on. (Details ➧ page 4-29.)

Friction on Slider Rod

The carriage bushings are made of a porous composite material. Oil stays inside them by means of capillary action. Never place the bushings on an absorbant material. To prevent friction of the bushings on the slider rod, remove dirt from the slider rod and chassis beam. Apply oil (Anderol 4068, HP part number: 6040-0858) to the slider rod (± 3 drops) and to the bushings if they are running dry.

Noisy Carriage Wheel

To prevent noisy movement of the carriage, remove aluminum or dust particles from the wheel at the back of the carriage, and from the slider path along which the wheel moves.

Ink Spilling

The service configuration plot gives an estimation of the amount of ink in the Printer's spittoon. (Details ➧ page 4-29.) To prevent ink spilling, replace both the spittoon and the ink-separator when the spittoon is almost full. About 880 primes are needed to fill up the ink-separator.

Note that if you clear the EEROM or replace the electronics module, the factory spittoon value is reset to 0% used. Keep in mind that the value printed on the service configuration plot may greatly underestimate the amount of ink in the spittoon.

Belt Swelling

To prevent new belts from swelling incorrectly, keep them in their bags with dissicant until you need to install them.

Cleaning the Printer

To maintain the Printer in good operating condition, keep it free of dust accumulation, ink, and other contamination. Cleaning intervals are determined by the Printer environment and by the types of Printer supplies used.

WARNING **Disconnect the Printer from the power source prior to performing any cleaning. DO NOT allow liquid to run on to electrical components or circuits, or through openings in the enclosure, as this can create a shock hazard leading to death or injury.**

General Cleaning

Proper general cleaning should include the following:

1. Blow away dust accumulation with compressed air if available.
2. Clean the outer surface of the Printer with a damp sponge or cloth. Use a mild soap and water solution if necessary. Do not use abrasive cleaners.
3. Wipe the Printer dry with a soft lint-free cloth.

Cleaning the Drive Roller

Due to the ink's reflectance, ink spilled on the roller can disrupt the Printer's edge-sensing function. To remove any ink from the roller, perform the following procedure:

1. Connect the Printer to the ac power source.
2. Switch the Printer ON, and wait for it to finish initialization.
3. Open the top cover.
4. Keep the cover switch pressed while pressing **Form Feed** repeatedly until the stained area of the drive roller is positioned at the top where it can be cleaned.
5. Turn the Printer OFF, and **disconnect it** from the ac power source.
6. Apply IPA (alcohol) to a soft, lint-free rag.
7. Use the rag to clean the roller surface.
8. Allow the drive roller to dry.
9. If other areas of the roller have been stained by ink, repeat the above steps.
10. Reconnect the Printer to the ac source, turn the Printer on, and load paper to test that no ink reflections disrupt operation of media loading.

10

Functional Overview

Introduction

The HP DesignJets 430, 450C and 455CA follow on from and replace the DesignJet 330 and 350C. The HP DesignJets 430, 450C and 455CA (like the DesignJets 230, 330, 250C and 350C) have inherited much of the system architecture and features of the DesignJet 220. Their writing system, however, is based on that of the DesignJet 650C.

This chapter describes some of the main features of the HP DesignJets 430, 450C and 455CA. Before reading it, read the functional overview of the DesignJet 220 ➧ *"HP DesignJet 220 and HP DesignJet 200 Printers − Service Manual,"* part number C3187-90000.

(Information on the DesignJet 650C ➧ *"HP C2858B/C2859B DesignJet 650C Service Manual,"* part number C2858-90000 Rev B).

Roll Media

When a roll-feed assembly is installed on the Printer, roll media can be used. The roll-feed assembly consists of:

- Two roll-feed components.
- A spindle.
- Two media stops.

The roll-feed assembly is installed below the sheet media entry path, to allow the ease of loading for sheet media. When roll media is loaded into the Printer, it is passed around a diverter roll, which optimizes the infeed path to the Printer. Once a plot/print is completed, a built-in cutter automatically slides across the paper to cut the plot/print from the roll.

Removing Static Charge from the Media

An anti-static brush located under the entry platen prevents static charge from building up on the media. A charge can cause the media to stick to itself and jam the Printer.

Gripping the Media

When you load the media, it is gripped by the pinch-arms.

Pinch-Arm Sensor

The pinch-arm sensor is a switch sensor that is attached to the Printer Chassis. It detects the position of the pinch-arm lever. Linkage, attaching the lever to a cam, causes the cam to release the switch as the pinch-arms are raised. The pinch-arm sensor is electrically connected to the main PCA.

Providing a Force on Top of the Media

Bail

The bail provides a normal force on top of the media. There is no bail sensor on the Printer to detect if the bail is up or down.

Bail-Lift Mechanism

The bail features an automatic lift mechanism driven by the media motor using a series of gears and actuated by the cartridge carriage. The cable-based design eliminates the torque on the axle of the bail-lift cam and thus improves reliability. This mechanism is also more accessible. (Removal ➧ page 8-28.)

Detecting the Lines and Media Edges

Line Sensor

The line sensor on the cartridge carriage is used to:

- Detect the left and right media edges.
- Detect and measure lines drawn on media when performing accuracy calibration.
- Scan the setup and alignment sheets.
- Find the platen roller reference mark.

Moving the Carriage

Carriage-Drive Mechanics

Motor, Belt and Pulley

- The carriage (Y-axis) drive consists of a DC motor directly driving a single belt and the carriage.
- The motor assembly itself provides the tension needed on the belt, eliminating the need for a separate pulley tensioner.
- The belt clamps itself to the carriage; there are no separate belt clamps.
- The interface between the motor shaft and belt is friction based.
- You can remove the belt without having to remove the pulley on the left end of the belt.

Carriage Guidance

The carriage moves along on just one stainless steel slider rod. It is guided by two integrated bronze bushings, which are self-lubricating, and a back wheel.

Positional Feedback

An encoder strip provides feedback on the position of the carriage. The strip does not require adjustment.

Carriage PCA

The carriage PCA is based on that of the DesignJet 650C. It connects to the main PCA through a long 60-conductor (2x30) trailing cable. The carriage PCA contains:

- Optical line sensor
- Thermistor circuit
- Linear encoder
- Cartridge nozzle firing circuit

Some electronic components on the DesignJet 450C and 450CA carriage PCA are not present on the DesignJet 430 carriage PCA. At power-on the Printer firmware identifies whether the carriage is for a color or a monochrome model, and behaves accordingly.

Providing Ink

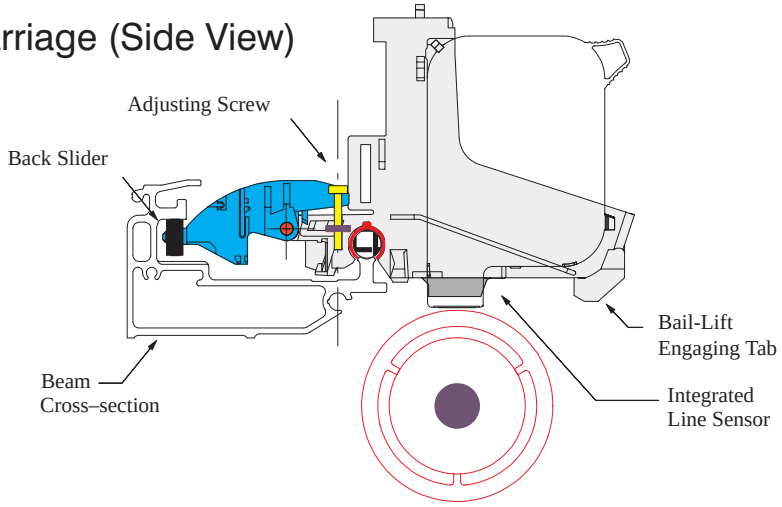
Print Cartridges

The HP DesignJets 430, 450C and 455CA use the same cartridges as does the HP DesignJets 330 and 350C.

Distance between Carriage and Media

The distance between the carriage and the writing surface can determine image sharpness. As the distance increases, the drop shape and directionality degrade and are more difficult to predict. You can change the distance using the adjusting screw on the carriage (details ➧ page 5-5).

Carriage (Side View)



Producing an Image

Print-Mode Characteristics

Note that the firmware can recognize from the plot data whether a plot is color or monochrome. You do not set this parameter on the front panel.

Servicing the Cartridges

Service Station

- The service station is easy to access and remove, and is replaceable as one unit.
- The absence of a drop detector implies a different cartridge-maintenance algorithm to guarantee correct nozzle conditions. The Printer warms the nozzles and spits ink:
  - Before each plot.
  - After each cartridge change.
  - While printing, depending on: cartridge, humidity, temperature, and plot ink density.
- The ventilation holes, which were located on the service-station sled on the DesignJet 650C, are now located on the ink separator to prevent them from becoming clogged.

Spittoon

A single, redesigned spittoon is located on the right side of the Printer.

Primer

The Printers feature a manual primer, based on that of the DeskJet 1200, instead of the automatic one of the DesignJet 650C.

- A bellows assembly provides a vacuum to suck ink from the nozzles. The suction tubes have a wider diameter than those of the DesignJet 650C, to help prevent clogging.
- An ink separator isolates the bellows from the cartridges, preventing ink contamination of the bellows.

Although the primers for the DesignJets 430, 450C and 455CA and DesignJets 230 and 250C look identical, their characteristics are different. Installing the incorrect primer can damage the cartridges or reduce the servicing of the cartridges. For the correct part numbers for the primers ➧ chapter 7.

Electronics Module

The electronics module includes the main PCA, power supply and fan. It is one exchangeable part; you do not need to open it. If you replace the electronics module, remember to swap any SIMMs from the old module to the new one.

Sensors

There is no bail sensor for the HP DesignJets 430, 450C and 455CA. There is a pinch-arm sensor which is different to the one installed on the HP DesignJets 330 and 350C. The following sensors connect to the main PCA:

- The **cover sensor** is a mechanical switch that detects if the Printer cover has been raised. If you open the cover while the Printer is plotting, the plot is cancelled!
- The **media sensor** detects the presence of media. It is also used to determine media length.
- The **line sensor** sends signals to the carriage and is used to detect the mark encoder and read alignment patterns. It is also used to determine media width.
- The **pinch-arm sensor** detects whether the pinch-arms have been raised. The servo processor uses the sensor to determine the pinch-arm position during the initialization sequence.

ROM

The Printer firmware code is contained on either an in-built masked ROM (soldered to the main PCA) or a flash ROM SIMM (installed in the inner-most socket at the back of the Printer). If both are present, the Printer recognizes the code on the ROM SIMM instead of that on the in-built ROM. The power-on LED sequence tells you whether the Printer is using code from in-built ROM or from a ROM SIMM. If the LEDs begin to light up from the right, then the Printer is using the ROM SIMM. If the LEDs begin to light up from the left, then the Printer is using the built-in ROM. To find out the firmware-code revision level that the Printer is using, print a user setup sheet or a service configuration plot.

RAM

The Printers have a standard four megabytes of on-board RAM. They also have one RAM-expansion socket, which can hold an optional 4-, 8-, 16- or 32-megabyte DRAM SIMM. The socket is the outer-most one at the back of the Printer.

EEROM

EEROM is used as nonvolatile storage for calibration and configuration data. Useful information from the EEROM is printed on the service configuration plot. The EEROM is soldered to the Main PCA in both new and rebuilt electronic modules.

If you clear the EEROM or replace the electronics module, perform all calibrations. Also note that the factory spittoon value on the cleared or new EEROM is 0%. Keep in mind that the value printed on the service configuration plot may greatly underestimate the amount of ink in the spittoon.

Input/Output Interfaces

The Printers have both a parallel (Bi-Tronics) and a serial (RS-232-C) interface. Unlike the DesignJet 650C, they have no modular input/output (MIO). You can connect the Printers to a network by means of an *HP JetDirect EX* or *HP JetDirect EX Plus3* external print server.

Bi-Tronics

In addition to the operating modes of the DesignJet 220, the Bi-Tronics interfaces feature the extended-capability-port (ECP) forward and reverse operating modes, providing for faster communication.

RS-232-C

The supported baudrates are 1200, 2400, 4800, 9600, 19200 and 38400, with eight bits and no parity, or seven bits with either odd or even parity. Mark parity is not supported. Both XON/XOFF and DTR handshaking are supported. ENQ/ACK handshake is not supported.

Power Supply

An auto-ranging power supply is located in the electronics module.

WARNING

The primary side of the power supply contains rectified line voltage that can be lethal when touched even if the ON/OFF switch is OFF.

In any case, you should not need to open the electronics module. It is one exchangeable part.

Water Condensation

In humid environments, water may condense on the side-plates. A wick attached to the underside of the right side-plate routes water drops away from the main-PCA electronics.

Memory Usage

It is difficult to calculate the amount of Printer memory needed to plot a drawing of any given file size. Memory is used, not just to hold the input data, but also for system overhead, processing work-space, and storage of the internal representation of the plot. Some types of graphics require relatively large amounts of memory. Examples are wide lines, raster fill patterns, polygons, and user-defined lines.

Plot Orientation

The output orientation of the drawing also has an impact on memory usage. Compare a plot of horizontal lines with one of vertical lines. Lines plotted parallel to the carriage axis take up considerably less memory than those plotted perpendicular to it. The Printer builds graphic display objects on a swath-by-swath basis. A horizontal line can be contained in one swath. A vertical line spans many swaths and therefore requires more entries in the Printer's internal display list.

Raster Image Processor

The raster transfer language (RTL) provides a solution to insufficient memory on the Printer. When all the data is sent to the Printer in the order left-to-right and top-to-bottom, the Printer is able to plot the data as it receives it. For this to happen, software (a raster-image processor) in the computer must first rasterize all the data. The software issues a command (referred to in RTL as **no negative motion**) telling the Printer that it will not receive data for any media location on which it has already plotted.

The use of no negative motion is called **flow mode**. Data flows through the Printer without being stored in a display list, so the size of the file that you can send is almost unlimited.

Glossary

Number of units.

°C Degree(s) Celsius.

°F Degree(s) Fahrenheit.

A 1. Amp(s).
2. Acoustic.

ac Alternating current.

accuracy calibration X-axis calibration.

addressable dpi A resolution higher than the nominal value of the cartridges, giving a finer grid on which the plotter can selectively position dots and improve print quality.

ASIC Application-Specific Integrated Circuit.

baud rate For the RS-232-C interface, the data transmission rate between the computer and the plotter (bits per second).

bidirectional print mode A print mode in which plotting is performed while the carriage is moving in either direction.

binding Obstruction to movement.

Bi-Tronics A parallel interface standard.

°C Degree(s) Celsius.

CAD Computer-Aided Design.

calib. Calibration.

CAM Computer-Aided Manufacturing.

carriage axis The axis along which the carriage moves. (Y-axis.)

carriage LED Line sensor.

cartridge Print cartridge (pen).

centronics A parallel interface standard.

checkout Of nozzles: testing of nozzles by firing them one by one.

checksum A programming method used to minimize data errors when data are transferred. ... (Part of a definition from *The Harper Collins Dictionary of Computer Terms*, © Ian R. Sinclair 1991.)

cm Centimeter(s).

Customer Engineers HP field support engineers.

D/A1-size plotters Models C3190A and C4694A.

data display Service monitor.

dB Decibel(s).

dc Direct current.

depletion The selective reduction of the number of drops placed on the media, in order to prevent an excess of ink on the media.

display data Service monitor.

display list An internal logical map, in swath format, containing data representing graphical objects.

DOS (MS-DOS.) MicroSoft Disk-Operating System.

dpi Dot(s) per inch, the plotter's resolution of raster images on the media.

DRAM Dynamic Random-Access Memory.

drive roller Platen roller.

drive-roller gear Helical gear at right-hand side of drive roller.

driver 1. An electronic circuit that provides input to another electronic circuit, (from *Webster's Ninth New Collegiate Dictionary*, © Merriam-Webster 1991).
2. Configuration data used by software to control input and output between the computer and the plotter.

DTR Data Terminal Ready.

duty cycle The amount of use a plotter should withstand without undue maintenance.

E/A0-size plotters Models C3191A and C4695A.

ECP Extended Capability Port. (A Bi-Tronics operating mode.)

EEROM Electrically Erasable Read-Only Memory.

electronics module The equivalent of the *electronics enclosure* of previous models in the DesignJet series. However, the electronics module is orderable as one part: you should not open it.

EPROM Erasable Programmable Read-Only Memory.

ESD Electrostatic discharge.

°**F** Degree(s) Fahrenheit.

film A type of media.

flow mode The plotting of images that have already been rasterized by computer software and do not need to be rasterized by the plotter itself.

ft foot/feet

half-toning The placement of dots to create a visual effect of different colors or different shades of gray.

helical gear Right-hand drive-roller gear.

HP Hewlett-Packard.

HP-GL Precursor of HP-GL/2.

HP-GL/2 Hewlett-Packard's standard graphics language for its plotters.

HP-RTL Hewlett-Packard Raster Transfer Language.

Hz Hertz.

IC Integrated Circuit.

IEEE Institute of Electrical and Electronics Engineers.

in Inch(es).

I/O Input/Output

IPA Isopropilic alcohol.

ips Inch(es) per second.

K Kilobyte(s)

Kana-8 A Japanese character set.

Kanji A Japanese character set.

Kbyte Kilobyte

kg Kilogram(s).

Kg Kilogram(s).

LAN Local Area Network.

lb Pound(s).

LED Light-Emitting Diode.

line sensor Carriage LED.

m Meter(s)

margin Part of the media on which the plotter is incapable of printing.

Mbyte Megabyte.

media (Used instead of medium.) The material on which the graphics are plotted: paper, translucent material, vellum, film, or special paper.

media axis The axis along which the media moves. (X-axis; paper axis.)

media jam A situation in which media becomes blocked in the plotter mechanisms.

media-jam lever Pinch-arm lever.

media-length calibration Media-sensor calibration.

media-sensor calibration Media-length calibration.

mil 1/1000 of an inch.

minimum pass time The time necessary for ink to dry sufficiently before the plotter can place more ink adjacent to it.

MIO Modular Input/Output.

mm Millimeter(s).

monitor mode Service monitor.

MS-DOS MicroSoft Disk-Operating System

no negative motion An RTL command that indicates to the plotter that it will receive all data already in the order in which it should be plotted.

off-axis ink system A system whereby ink is pumped to the cartridges from a reservoir that does not move with the carriage.

PAL Programmable Array Logic.

palette A set of pens for which width and % shading are defined using the setup sheet or the graphics software.

paper axis Media axis (X-axis).

parity An error-checking method for information transfer between a computer and a peripheral device. Parity is used to check the accuracy of binary data.

pass A movement of the carriage from left to right, or from right to left, as it plots the graphic.

pass advance The distance that the media advances between carriage passes.

PC Personal Computer.

PCA Printed Circuit Assembly.

pen 1. Even though the inkjet plotter has no physical pens, the lines it draws match the attributes for pens numbered 1 through 8 in the application software. (See also "palette.")
2. Sometimes used instead of "print cartridge."

pinch-arm lever Pinch-wheel lever, media-jam lever.

PJL Printer Job Language, developed by Hewlett-Packard to give software applications more job-level device control and to provide device status information to the application.

platen roller Drive roller.

plot quality Print quality.

PML Printer Management Language.

P/N Part Number.

power cycle The switching of the plotter off and then on again.

primary colors cyan, magenta, yellow, black.

print quality Plot quality

Product Line 30 Hewlett-Packard's product line of large-format, pen and thermal-inkjet plotters.

PWM Pulse-Width Modulation.

RAM Random-Access Memory.

raster 1. A matrix of dots, or pixels, where each pixel is defined by a bit. A bit that is "on" will print a dot on the paper. A bit that is "off" will leave the area blank. 2. A method for defining a plot directly in terms of the pixels rather than as vectors.

raster image processor Software that converts graphics data to pixel format.

relative humidity The ratio of the amount of water vapor actually present in the air to the greatest amount possible at the same temperature, (from *Webster's Ninth New Collegiate Dictionary*, © Merriam-Webster 1991).

resolution A measure of image sharpness expressed as a number of lines per unit length. When referring to plotters, addressable resolution means the smallest move the plotter can make programmatically.

rms Root mean square.

ROM Read-Only Memory.

roman A character set based on the Latin alphabet.

RS-232-C interface A serial interface standardized by the Electronic Industries Association Standard RS-232-C.

RTL see "HP-RTL."

sec Second(s).

secondary colors Red, blue, green.

service monitor Data display; display data; monitor mode.

SIMM Single In-line Memory Module.

skew Misalignment.

special paper A paper specifically developed by HP, for HP inkjet plotters.

SPROC Servo-Processor Code.

swath That portion of a drawing plotted between advances of the drive roller in **Fast** mode. (In **Best** mode, the drive roller advances half a swath at a time; in **Normal** mode, it may advance a full swath or half a swath, depending on whether the plot is color or monochrome.)

TCP/IP Transmission Control Protocol / Internet Protocol.

theta-Z error A print-quality error caused when the nozzles on a cartridge are not perpendicular to the carriage axis. The error shows up as jagged vertical lines.

translucent Describes a type of media through which light passes.

TTOE Thermal Turn-On Energy.

UART Universal Asynchronous Receiver Transmitter.

unidirectional print mode A print mode in which plotting is performed while the carriage moves in one direction, and no plotting is performed while the carriage moves in the opposite direction.

vellum A type of strong paper.

VLS Vertical-line straightness.

X-axis Media axis.

X-axis calibration Accuracy calibration.

Y-axis Carriage axis.

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About This Edition

This is the first edition of this service manual.

1st edition, titled
HP C4713A, 4714A, 4715A, 4715A, C6080A and C6081A
HP DesignJet 430, 450C and 455CA Service Manual, September 1997

HEWLETT PACKARD

What's in This Book

This manual contains information necessary to test, calibrate and service

- HP DesignJet 430 printers (models C4713A and C4714A)
- HP DesignJet 450C printers (models C4715A and C4716A)
- HP DesignJet 455CA printers (models C6080A and C6081A)

For information about using these printers, refer to the corresponding user and quick-reference guides.

The procedures described in this manual are to be performed by HP-qualified service personnel only.